UNIVERSITY OF ALBERTA

Situated Cognition in a Technology-based Learning Environment

By

Guohua Pan ©

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Abstract

A case study of a computer-based simulation of a junior high school principalship was undertaken to investigate the influence of situated cognition on student learning. Interview and participant observation were use for data collection from twelve students registered in the computer-based simulation course. Six elements of situated cognition were identified as potentially existing in the course. Students claimed to have been in general positively influenced by someelements of situated cognition. Some suggestions were put forward as to how weak or missing elements of situated cognition could be incorporated for potentially effective and robust learning in a computer-based learning environment. A model of situated cognition has been proposed that may potentially guide the design of effective technology-based learning environments. Further studies are suggested for examining whether and how the proposed model of situated cognition works in guiding the design of technology-based learning environments.

Acknowledgements

It has been a painful, difficult, yet exhilarating, and immensely rewarding process to undertake this project of investigating and understanding situated cognition. This would not have been possible without the support from Dr. David Mappin and Dr. Michael Szabo. I would hereby express my sincere appreciation and gratitude for their vision, their insight, their intellectual and emotional support throughout the process. It has been a privilege to work with them.

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Table of Contents

Chapter 1: Introduction ---------- 1
  Background ---------- 1
  History of Project Decide ---------- 4
  EDPS501 the principalship course ---------- 7
  Research questions ---------- 15
  Significance of the study ---------- 16
Chapter 2: Review of literature ---------- 19
  Situated Cognition: One model of constructivist learning ---------- 19
  Context ---------- 21
    Context in computer-based instruction ---------- 23
  Authenticity ---------- 26
    Authenticity in computer-based instruction ---------- 29
  Enculturation ---------- 34
    Enculturation and community of practice in computer-based instruction 39
  Apprenticeship and cognitive apprenticeship ---------- 42
    Cognitive apprenticeship in computer-based instruction ---------- 47
  Collaborative learning ---------- 50
    Collaborative learning in computer-based learning ---------- 54
  Scaffolding ---------- 54
    Scaffolding with technology tools ---------- 56
  Alternative views on situated cognition ---------- 57
  The effect of a computer-based simulation course: A researcher's point of view---- 59
  Conclusion ---------- 62
Chapter: 3 Method ---------- 63
  Choice of research method ---------- 63
  Qualitative approach ---------- 64

Research design ---------- 67
    Case study ---------- 69
    Observation ---------- 70
    Interviews ---------- 71
Study timeline ---------- 73
    Pilot study ---------- 73
    Main study ---------- 74
Change in my supervisory committee ---------- 75
Access and ethical considerations ---------- 75
Participants ---------- 76
Data collection ---------- 77
Data analysis ---------- 78
Trustworthiness ---------- 79
    Credibility ---------- 79
    Transferability ---------- 82
    Dependability ---------- 83
Limitations and delimitations ---------- 85
Chapter 4: Data Analysis ---------- 88
The class ---------- 88
Contextual elements ---------- 89
Authenticity: A life like, vicarious experience ---------- 97
The culture ---------- 103
Cognitive apprenticeship ---------- 109
Cognitive apprenticeship outside the simulation ---------- 113
Collaboration ---------- 114
Scaffolding ---------- 118
Contextual elements and their impact on understanding and decision making -- 120
Authenticity and learning ---------- 123
Enculturation: Leadership, responsibility, and shared value ---------- 128
Cognitive apprenticeship: Missing ---------- 130

Collaboration: Interacting, sharing, and learning from others ------------------------ 134
Scaffolding: Enabling better ideas, effective decisions, and sustaining learning - 137
Collaboration: Opportunity for thought exchange and learning from difference - 141
Feedback: Learning the consequence, and thinking about thinking ---------------- 145
Organizational culture: Empowering Kelly Goslyn, the principal ------------------ 150
Cognitive apprenticeship: Missed in the simulation ---------------------------------- 152
Chapter 5: Discussion --- 158
Contextual information: Setting the stage for effective learning ------------------- 158
Authenticity: True to life problems and déjà vu -- 164
Enculturation: A process of adapting and creating -------------------------------------- 169
On scaffolding: In need of the right help at the right time ----------------------------- 175
Cognitive apprenticeship: A path from novice to expert -------------------------------- 182
Collaboration: Learning in social milieu --- 192
Chapter 6: Summary, Model, and Implications for Future Research ------------------ 199
Summary --- 199
The elements of situated cognition -- 203
An exploratory situated design model -- 207
A computer-based learning environment under the exploratory situated cognition model -- 209
Implication for future research -- 213
Conclusion --- 214
References --- 216
Appendix A Questions Used in Student Research Interviews ------------------------- 229
Appendix B Interview schedule -- 232
Appendix C Consent form -- 233

List of Figures

Figure 1 Function bar ---------- 10

Figure 2 Open boundaries ---------- 11

Figure 3 Resources ---------- 12

Figure 4 Teen pregnancy ---------- 12

Figure 5 Response record ---------- 13

Figure 6 Suggested model of situated cognition ---------- 208

Chapter One: Introduction

Situated cognition in a technology-based learning environment

Background

Information and communication technology (ICT) is "dramatically transforming" knowledge acquisition and "automating the component processes of thinking and problem solving" (Pea & Brown, 1991, p. 12). Technology is increasingly being used for learning and instruction (Khan, 1997, Romiszowski, 1997). As a relatively new medium for information storage and transmission with "innovative technology tools and features" (Bonk & Reynolds, 1997, p. 117), ICT is not only redefining the meaning of learning and understanding, but to an increasing extent how learning takes place as well (Brown, 2000). Technology is seen as one of the most important ways to change an individual, a group, or even a nation's fortune.

The Internet, the latest information communication technology, is heralded as the "most transformative technology in history" that will possibly make learning "a practical reality" to everyone: man, woman, and child (the U.S. Web-based Education Commission, 2000, http://interact.hpcnet.org/webcommission/Section_1.htm). The Internet, the World Wide Web in particular, is believed to empower society by schooling the illiterate, bringing job training to the unskilled, and enabling students "to harness the global web of knowledge" (http://interact.hpcnet.org/webcommission/Section_1.htm). ICT, with all the possibilities it brings with it, offers the beginning of a new way of learning.

At the same time, the U.S. Web-based Education Commission (2000) points out that education today may not be up-to-date since it "is built on an agrarian model that worked in the years when we were a nation of farmers, foresters, and fishermen and that elements of the industrial revolution were added to schooling to meet the needs for Industrial Age" (http://interact.hpcnet.org/webcommission/Section_1.htm). In the same vein, this unique way of learning through the ICT differs, sometimes greatly from that of in an agrarian model or in an industrial age model. Simply applying technology to existing learning models, therefore, cannot solve everything. As the U.S. Web-based Education Commission (2000) cautions us: "the Internet is not a panacea for every problem in education" (http://interact.hpcnet.org/webcommission/Section_1.htm). Technology alone does not make things happen. Kearsley (1999) notes that the highly heralded, individualized instruction provided by computer-based instruction has had trivial success, mostly through drill and practice and tutorial programs. It is noted that too much attention is devoted to hardware – computers, wires and cabling – as if learning would automatically pop up as long as the courses are delivered (Makenzie, 1998; Trilling & Hood, 1999).

Carr, Jonassen, Litzinger, and Marra (1998) point out, "It is not the technology which changes the things, it is the way in which people use the technology that has the potential to change our classroom practice" (p. 5). Learning theories must be employed to guide the application of technology for effective and robust learning. More effort needs to be placed on other things so that technology can be used as a potent tool to encourage and facilitate "broader reforms in school structure, curriculum, teaching and learning" (U.S. Congress - Office of Technology Assessment, 1995). But what theories? How do they work?

In some ICT courses that I took at the Department of Educational Psychology, Faculty of Education, the University of Alberta, I came across various learning theories, including behaviourist-oriented and constructivist-oriented theories. Through study I found situated cognition, a theory based in constructivism, to be especially relevant to the issues that I have been describing. While learning this theory, I was engrossed in the many elements situated cognition possesses that are believed to be essential for effective and robust learning. Barab and Duffy (2000) describe elements such as ownership of inquiry, coaching and modeling, reflection, ill-structured problems, scaffolding, collaboration, and motivation. According to them, students' ownership of the inquiry comes from the students' investigation of real problems and their efforts to develop a solution that makes a difference. Student reflection enables individual students to "ask why they are doing what they are doing and to correct misconceptions and fill in where understanding was inadequate" (p. 32). Ill-structured problems allow the students to impose their own problem frames, to enable students to assume ownership of these problems, and to foster learning. Scaffolding enables the students to solve real problems that are usually complex. A continual collaborative and social setting allows the students to negotiate meaning through assimilation and accommodation, while a motivating learning context with relevant background information facilitates students' understanding and solving of problems. Situated cognition, as has been argued, promises great theoretical potential for improving learning (Barab and Duffy, 2000; Henning, 2004; Hung, 2002).

While exploring the application of situated cognition to ICT-based instruction, I learned that there had been a course developed at the Faculty of Education that was designed and delivered in a way that could be interpreted as a variation of situated cognition. This course, EDPS 501, The School Principalship: Seminars and Simulations, was offered at the Department of Educational Policy Studies at the Faculty of Education, the University of Alberta. After further investigation I was advised that it was possible for me to conduct my proposed research in the class when it was delivered. After consulting my advisors, I decided that I would study situated cognition in this particular computer-based instructional environment.

History of Project Decide

Project Decide was the name given to a research and development project initiated and conducted by Dr. Gordon McIntosh and his colleagues in the Department of Educational Administration, Faculty of Education, the University of Alberta. The project aimed to develop an effective learning environment to improve preparation programs for graduate students interested in becoming principals. It was this effort which ultimately evolved into the Aberhart Junior High School Simulations.

The effort of creating a simulation environment for use within a seminar course on the principalship began in 1983, when Dr. McIntosh collected a series of critical incidents related to principalship for study and possible use in a series of 'in-basket' exercises. In order to guide the work of Project Decide, Dr. McIntosh and his colleagues, Dr. Ernie Ingram and Dr. Ken Ward, assembled the Project Decide Steering Committee in the fall of 1983. The members of the committee included some administrators from the Edmonton Public School Board. David Mappin, Director of the Instructional Technology Centre in the Faculty of Education, joined the committee in 1984.

In the school year of 1983-1984, more stories of incident were collected from principals and analyzed, validated, and developed in a particular format for 'in-basket' exercises that were to be embedded in a graduate course on principalship. The data were mainly collected and presented in text format.

In the 1984-85 school year, the in-basket exercises were placed in a simulation framework and presented in a graduate course, the first simulation of the Pembina Elementary School. Like any other school, the fictitious Pembina School had its own teaching and support staff, and pupils. Videotape was used in the simulation as it could provide more realistic scenarios and situations than text-only presentation could (Mappin, 1996).

Late in 1985, two video programs were developed for new students' orientation to the course. One involved a meeting with the school superintendent and his associate, and also a tour of the community. The other featured a meeting with the outgoing principal. Some other features developed at the time included the use of random access video that could present specific in-basket items or provide video support at necessary moments during the simulation. As well, telephone calls to the students from various sources were developed and introduced to the simulation.

In the winter term of 1985-1986, the first field test of the course was offered in the Department of Educational Administration. The course was offered six more times by 1989. During this time limitations were found with the random-access video technology used for the simulation. Also, the clerical requirements for managing a paper-based support system for each student were found to be very onerous as the entire file box had to be checked and reassembled in the proper order after each use.

During the fall of 1988 and the whole of 1989 the simulation materials were enhanced and modified for conversion to a computer-based interactive videodisc format, the IBM Info-Windows system. The revised course was offered in the winter session of 1990. The course was offered eight times from 1991 to 1995. About 1991, the computer control format was changed to permit the use of a less expensive videodisc system and the number of delivery stations was enlarged to 6, then to 12.

Also in 1991, a new simulation project was undertaken to simulate a junior high school – the fictitious Aberhart Junior High School (Mappin, 1996; Maynes, Mappin, & McIntosh, 1998; Maynes, McIntosh, & Mappin, 1993).

Along with the development of Project Decide, some guiding theoretical underpinnings also evolved. Initially, Dr. McIntosh and Dr. Ingram based their ideas on the in-basket materials developed by Dr. Walter Hartrick from the University of British Columbia, and on case studies and in-basket simulations. In 1984 when the team was expanded to include Mappin, the theoretical approach shifted to an emphasis on experiential learning by Kolb (1984) and was further enhanced by the ideas of reflective practice by Schön (1983, 1987). Later, newer ideas of learning from cognitive psychology were introduced into the theoretical framework and these guided the design of the new computer-based simulation of Aberhart Junior High School. The new ideas included solving ill-structured problems (Spiro, Feltovich, Jacobsen, & Coulson, 1991; Voss, 1989) and situated cognition (Brown, Collins, & Duiguid, 1989; Lave & Wenger, 1991) (Mappin, 1996). A number of the students' suggestions that emerged from offerings of the Pembina Elementary School Simulation also influenced the design of the project.

EDPS 501- the principalship course

EDPS 501, The School Principalship: Seminars and Simulations, is a graduate course for school principals and aspiring principals. The course, like its predecessor, aims to engage students in a set of vicarious experiences in which the students reflect on their administrative behaviour as school principals in a disciplined manner (Maynes, McIntosh, & Mappin, 1993). The simulation materials are contained on 5 CD-ROMs and include approximately 225 minutes of digital video. The course consists of class discussion seminars, simulation sessions in the computer lab, readings, and journal writing that enables the students to learn to systematically reflect on their performance as school administrators. Students are encouraged to gain a greater understanding of their personal actions in administrative situations through reflection and to place them in a broader context of theory, research findings, values, and the experiences of others (Maynes, McIntosh, & Mappin, 1993).

To a large extent, Kolb's (1984) conception of experiential learning served as the theoretical underpinning of the design for this course. Kolb's experiential learning model is a four-stage cycle:

> Immediate concrete experience is the basis for observation and reflection. These observations are assimilated into a "theory" from which new implications for action can be reduced. These implications or hypotheses then serve as guides in acting to create new experiences. (p. 21)

In this cycle vicarious work experience consolidates what the learners learn in other university courses and often offers something that learners cannot get in their other courses. The Aberhart Junior High School simulation, therefore, was a simulated workplace, "a learning environment that can enhance and supplement formal education and can foster personal development through meaningful work and career-development opportunities." (Kolb, 1984, p. 4).

Along with Kolb's conception of experiential learning and the Lewinian experiential learning model, Maynes, McIntosh, and Mappin (1992) developed an instructional model of four essential elements that guided their design and development of the computer-based simulation course:

> 1. experience of the field of practice, as provided by simulations of the work of the school principal, in which the learner actively makes decisions in problem simulations-some of obvious major import, others apparently trivial;
>
> 2. critical reflection on decisions taken and rationales offered for these decisions, first of all through discussion with peers and instructors in follow-up seminars, and later through discussion reading and journal writing;
>
> 3. proactive planning in group tutorials based on assessments of the fundamental underlying issues characterizing the present situation in the simulated school which must be addressed if the organization is to build on its strengths and best compensate for its weaknesses. These assessments are to be made within a framework of the participant's developing conception of the direction in which he or she, working with the staff, would like to take the school;
>
> 4. the organization of learning so acquired by the participant, integration of this personal learning with the literature pertinent to the field of study and with personal values and capacities as these become progressively more clear to the learner. (Maynes, McIntosh, & Mappin, 1993, pp 7-8)

Maynes, McIntosh, and Mappin (1992) had claimed that traditional classroom education often failed to provide a range of issues for the students "to work with and learn from" (p. 270). The simulation was to address this issue of 'breadth of experience' by providing opportunities for students to deal with a variety of problems that were otherwise unavailable. As well, it was to address the issue of 'the exercise of responsibility' by granting the students full responsibility for resolving issues, regardless of the severity of the issues, instead of involving them "only as observers" with little responsibility as might happen in a traditional school internship (p. 271). These computer-based instructional simulations substitute the experience of field practice. They are delivered in a Faculty of Education's computer lab. During the work session each student logs onto a computer in the lab and works on the set of problems and issues in the order of her or his choosing. Each student takes the role of Kelly Goslyn, the newly appointed principal of Aberhart Junior High School in the Rutherford School District, from the very first day of the course. Usually, the simulation begins with a video segment in which a character in the simulation, such as assistant principal Stephane Boivin, school secretary Shirley Smithers, or a teacher, briefs Kelly on some important problems, accidents, or other things of concern that have happened while Kelly was away from school. Other computer-based forms of presentation, such as memos, notes, and unscheduled video encounters, are also used to brief Kelly. This briefing enables the student, acting as the principal, to focus more easily on the problems of the day while also providing additional information about the problems for them. The student, having made the necessary investigations, uses an electronic reporting form called the Response Record to record her/his decisions and actions during the work session. S/he would print out the record of her/his decisions to help them share and discuss their decisions in the follow-up classroom seminars. S/he can revise the decisions, as a result of these discussions and/or reflect in her/his writings on the actions s/he took.

There are many other problems presented in the same fashion as the ones described so far. Altogether there are three work sessions simulating problems occurring at Aberhart Junior High School during one-half day in each of September, November, and March. Before beginning any of the work sessions students work through orientations to the school, the school district and the community. They also do a short practice work session to familiarize themselves with the simulation desktop environment and the methods for presenting the issues and problems.

While working on the problems in each simulation, a student can look at an extensive set of reference materials embedded in the program. These are clustered in drop down boxes of the Function bar (Fig. 1) under the headings 'People', 'School', 'District', 'Community', and 'Reference'. Proceeding to the lists in the drop down boxes, the student can link to information or reference materials indicated by the heading. Under the heading 'People', for example, the student can find sub-drop down boxes titled "Teachers", "Staff", "Students", "Volunteers", and "Community Resources". If the student selects "Teachers", s/he may find the name of the teacher s/he is interested in, the university from which s/he graduated, the experience s/he has had, subjects s/he teaches, and her/his performance evaluations while at Aberhart Junior High School.

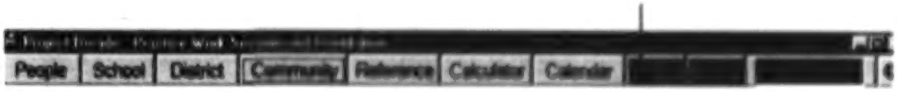
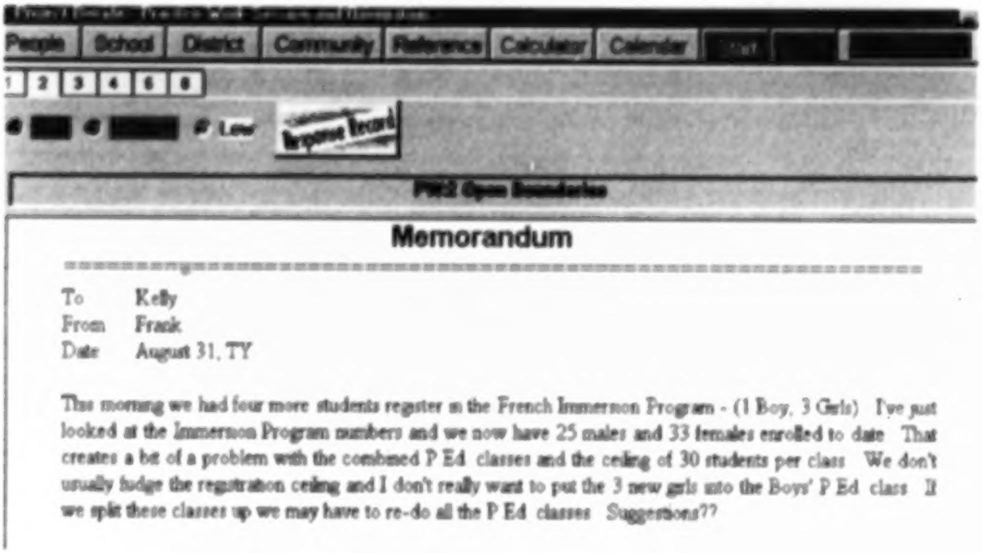


Figure 1. Function Bars

Usually, the simulation starts with a screen of function bars (Fig. 1). As soon as 'Start' is clicked (see arrow in Fig. 1), the clock at the top-right corner of the screen starts to run in a decremental fashion and the simulation begins.

Let us walk through a process of problem-solving in the Practice Work Session. Having logged into the computer-based simulation, a student clicks the 'Start' button to begin this session. Immediately after 'Start' is clicked, the following memorandum screen (see Figure 2 on next page) is displayed and 'Start' becomes dim.

The memorandum displayed is from Frank Kindred and concerns the size of the physical education class. It is this problem that that the student is expected to deal with.



Memorandum

To Kelly
From Frank
Date August 31, TY

This morning we had four more students register in the French Immersion Program - (1 Boy, 3 Girls) I've just looked at the Immersion Program numbers and we now have 25 males and 33 females enrolled to date That creates a bit of a problem with the combined P Ed classes and the ceiling of 30 students per class We don't usually fudge the registration ceiling and I don't really want to put the 3 new girls into the Boys' P Ed class If we split these classes up we may have to re-do all the P Ed classes Suggestions??

Figure 2. Open Boundaries

In order to learn more about the staff, student or facilities related to this problem, a student uses the reference materials described above. Suppose Kelly wants to learn more about Frank. To do that, s/he moves the cursor to 'People' and clicks on it. Kelly then uses the drop-down box under 'Teachers' to find 'Kindred' and calls up Frank's file (Fig. 3). Alternatively, Kelly can click any one of the numbered yellow tabs just below 'People', 'School', or 'District' to deal with the other problems in the work session (Fig. 2).

While there are only 6 problems in the practice work session, there are 21 to 24 problem items in each of the other three work sessions. The problem items are numbered

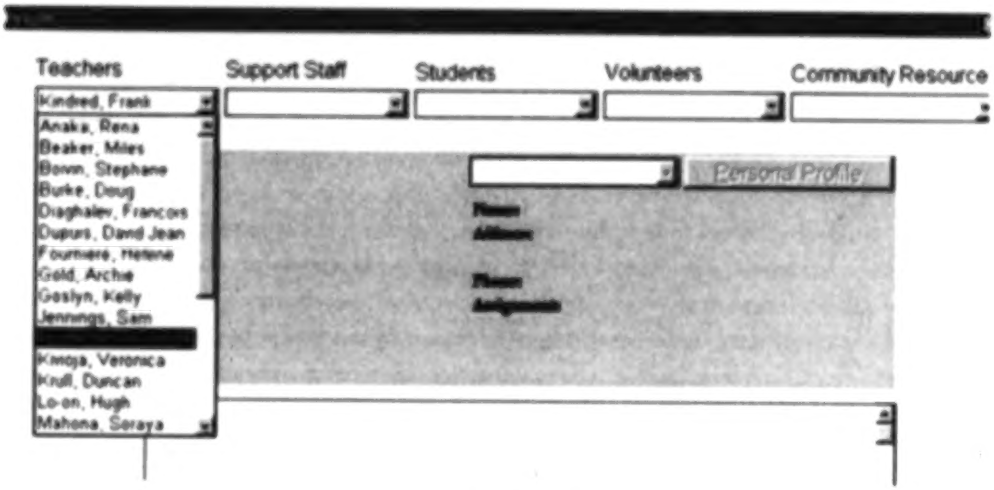

Teachers
Support Staff
Students
Volunteers
Community Resource
Kindred, Frank
Anaka, Rena
Beaker, Miles
Bown, Stephane
Burke, Doug
Diaghalev, Francois
Dupuis, David Jean
Fourniere, Helene
Gold, Archie
Goslyn, Kelly
Jennings, Sam
Kmoja, Veronica
Krull, Duncan
Lo-on, Hugh
Mahona, Soraya
Personal Profile

Figure 3. Resource

sequentially on tab at the top of the screen (Fig. 2). When Kelly clicks the yellow button for #3, for example, the following screen will appear (see Figure 4). The picture in the middle of the screen is a video clip on the issue. Kelly can click on the picture and the video will play on screen on an enlarged frame.

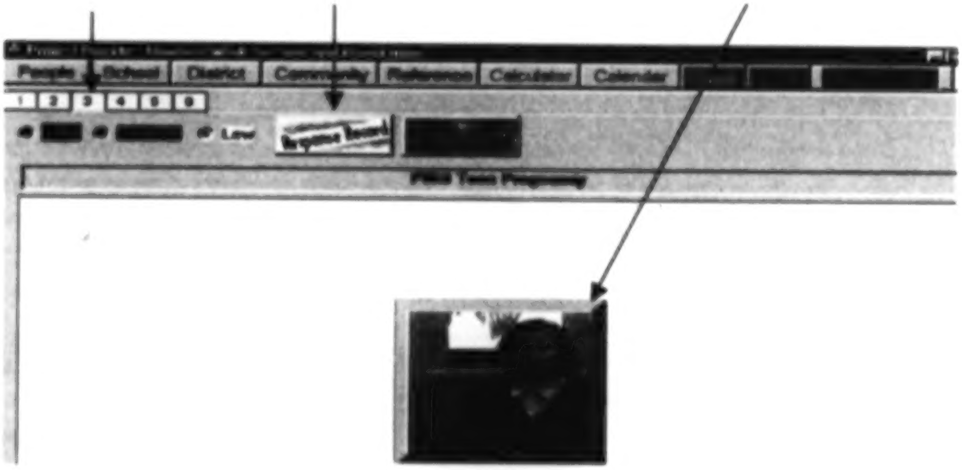
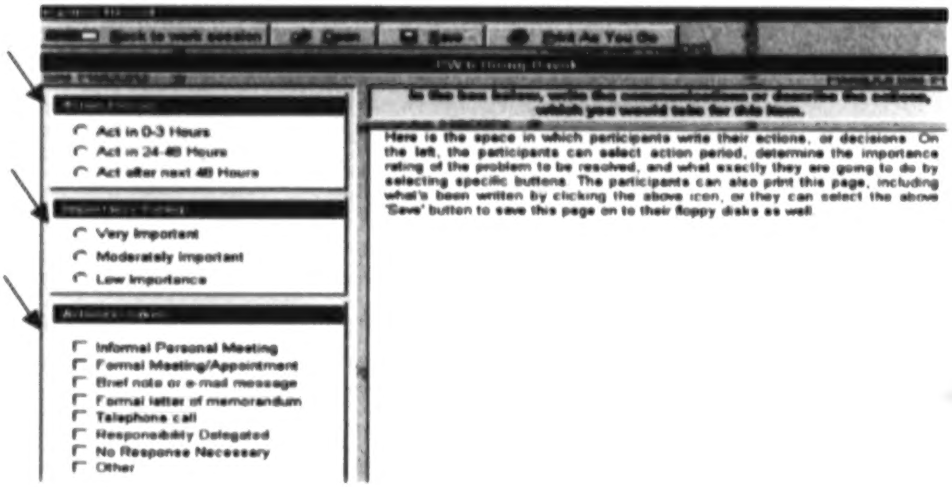

People
School
District
Community
Reference
Calculator
Calendar
1
2
3
4
5
6
Low

Figure 4. Teen Pregnancy

The video is shot from a first-person point of view, that is, as seen through the eyes of Kelly, the newly appointed principal. In addition to clicking on the picture in the middle of the screen, students may also view 'You Remember' video segments by clicking on the button so labeled on the function bar. These segments provide 'memories' for students of what people may have said to Kelly about the related issue or issues of concern being investigated or things that Kelly may have seen.

After reading the memo or watching the video presenting the problem, Kelly may want to have a look at a certain staff or student file in order to learn more about the person in question. As well, Kelly may wish to find and read all policies and documents related to the problem being dealt with. As described above, all those text-based materials are embedded within the boxes connected to the 'People', 'School', 'Students', 'Community', and/or 'District' labels. Having made the necessary investigation through watching video clips, listening to audio clips, and reading text files, Kelly now needs to make decisions as to how s/he should deal with the problem. To do so, Kelly will need to click on the 'Response Record' button (See the arrow-marked button in Figure 4) to call the 'Response Record' form (see Figure 5). The area on the right of the form is the space


Back to work session
Open
Save
Print As You Go
○ Act in 0-3 Hours
○ Act in 24-48 Hours
○ Act after next 48 Hours
○ Very Important
○ Moderately Important
○ Low Importance
☐ Informal Personal Meeting
☐ Formal Meeting/Appointment
☐ Brief note or e-mail message
☐ Formal letter of memorandum
☐ Telephone call
☐ Responsibility Delegated
☐ No Response Necessary
☐ Other

In the box below, write the communications or describe the actions, which you would take for this item.

Here is the space in which participants write their actions, or decisions. On the left, the participants can select action period, determine the importance rating of the problem to be resolved, and what exactly they are going to do by selecting specific buttons. The participants can also print this page, including what's been written by clicking the above icon, or they can select the above 'Save' button to save this page on to their floppy disks as well.

Figure 5. Response Record

where Kelly describes the action(s) s/he will take using the text editor provided. Besides writing, Kelly will also select buttons on the left-hand side of the screen to determine when s/he will deal with the problem, how important the problem is perceived to be, and/or what specific action(s) they will take. In a similar fashion Kelly is required to work through to all the items.

The students are then asked to print out a record of their actions using a printer attached to the computer network. These printouts may be for their use in the follow-up debriefing seminars or to hand in should the professor ask to see them. The students may revise their decisions as the work session proceeds. The students are also encouraged to save their responses on a floppy disk. Later, they may reflect, in their journal writing, on the actions they will take and on guiding theoretical underpinnings drawn from readings and peer comments, as well as on their previous work experience.

As has been discussed, situated cognition was one of the new ideas from cognitive psychology introduced to the theoretical framework for guiding the design of this EDPS501 course. Situated cognition appears to me to provide a learning model that can potentially be very effective in guiding the development of a robust computer-based learning environment (Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995; Greene et al., 1998; Henning, 2004, Hung, 2002; Lave & Wenger, 1991). Situated cognition, as has been argued, is able to create an authentic learning environment in which background/contextual information is provided to aid learners in more closely and accurately understanding issues. It also provides the possibility for learners to work collaboratively on solving problem, to receive help from experts and more experienced peers when needed, and to advance from being novice learners to seasoned problem solvers through this mentoring and collaboration (Barab & Duffy, 2000; Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995; Henning, 2004; Hung, 2004; Lave & Wenger, 1991; Wilson & Myers, 2000).

On the other hand, situated cognition is seen as a theoretically "still-evolving project" that endeavours to "understand learning in both its individual and social aspects" (Kirshner & Whitson, 1998, p. 22). As such, some key elements that constitute situated cognition have been challenged. Instead of stress on context in situated cognition, for example, Anderson, Reder, and Simon (2002) argued that there are generic learnings that were transferable to almost any context. Regarding authentic learning, Beiderman and Shiffrar (1987), Fong, Krantz, and Nisbett (1986), and Raeed and Actor (1991) demonstrated that learning did not only occur in concrete specific situations. People could learn quite well through abstract instruction, too. The social aspect of learning in situated cognition environments was also seen as problematic (Nelson, 1999) and was therefore not a panacea (Anderson, Reder, & Simon, 1996; 2002). I was thus intrigued to investigate whether the Aberhart Junior High School simulation had all of the elements of situated cognition and how students might be seen to interact with and learn from those elements.

Research questions

Writing on situated cognition has identified six elements as essential for a learning environment built on this theory (Altalib, 2002; Barab & Duffy, 2000; Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995; Cobb & Bowers, 1999; Greeno and the Middle School Mathematics Through Application Project Group, 1998; Henning, 2004; Hung, 2002; Kirshner & Whitson, 1998; Lave & Wenger, 1991; Wilson & Myers, 2000). Those elements are: context, authenticity, enculturation, cognitive apprenticeship, collaboration, and scaffolding. Whether or not these elements work and how they work must be studied in practice. I thus proposed a study of EDPS501 to investigate this. It was my hope that an exploratory situated cognition model as developed on the basis of this study could be developed to guide the design of other learning experiences in the course.

Through a comparison of the computer-based simulation course with the framework for situated cognition I identified, the following four questions were developed to guide the inquiry:

1) What are the elements in the computer-based simulation, "Simulation of the Junior High School Principalship," that could be interpreted as being part of a situated cognition framework?
2) How might we describe and interpret student learning in this simulation from the perspective of situated cognition?
3) What could be done pedagogically, or by way of meta-cognitive development, to enhance student learning in this simulation (course)?
4) Based on the current theoretical framework of learning, what key elements of situated cognition could be added to those that already exist in the computer simulation course design?

Significance of the study

ICT with its embedded features and tools enables us to do many things we could not otherwise do in providing learning opportunities for students. Still, the introduction of technology into education has made little progress (Kearsley, 1999). Technology itself will not make learning happen, as the experience of the students (including myself) who have taken computer-based instruction courses has shown. Rather, it is the way in which people use technology that can make it effective for learning and that has the potential to encourage and facilitate "broad reforms in school structure, curriculum, teaching, and learning" (Carr, Jonassen, Litzinger, & Marra, 1998; US Congress - Office of Technology Assessment, 1995; US Web-based Education Commission, 2000).

This study suggests that technology per se is not a panacea and that the learning theory that guides the use of technology and the design of the learning experience many times plays a decisive role in determining whether technology is effective in fostering student learning. Secondly, this study suggests that situated cognition is an effective learning model in the case studied. It therefore supports the use of situated cognition as model for designing learning experience. Thirdly, the study shows that a learning theory, no matter how sound it may be, can't be applied mechanically. It must be applied in a way that is adapted to the learning context. As an evolving idea, situated cognition may be advanced through accommodation and assimilation (Kirshner & Whitson, 1998). The study also addresses the issues raised by those who challenge situated cognition or who see the effectiveness of situated cognition as dubious in the context of one course. The findings obtained from this empirical inquiry will enrich the literature of situated cognition. Last but not least, this study and the model that I have proposed, serve as pioneers in terms of empirical research on situated cognition and thus may potentially open new avenues for the application of situated cognition to learning and for future research.

In reporting this study, I have provided Chapter 2 as a review of literature, Chapter 3 as a description of the research method, Chapter 4 as a presentation of the findings, Chapter 5 as a discussion of the findings, and in Chapter 6 I present a summary, an exploratory model for designing learning experiences, and implication for future research.

Chapter Two: Review of Literature

In this chapter, I review the literature on situated cognition. First I will review the idea of learning in a situated environment and then I will review six specific elements which are thought to be essential to learning in situated cognition, including the roles they have taken or might take in computer-based learning. Those elements are context, authenticity, enculturation, cognitive apprenticeship, collaboration, and scaffolding. After reviewing them I will consider some contrary views of situated cognition and conclude with a review of the ideas on which the simulation central to this project is based.

Situated cognition: One model of constructivist learning

Constructivist theory is largely based on the work of Dewey and other psychologists such as Vygotsky, Piaget, and Bruner (Bereiter & Scardamalia, 1996; Kearsley, 2004; Mahoney, 2004). Constructivists view learning as a process in which individual learners actively construct personal knowledge based on their prior knowledge (Kearsley, 1999). Further, in constructivism learning should take place in a realistic environment involving authentic tasks and substantial problem solving. One last tenet to be mentioned here is that knowledge is both individually and socially created through interactions between individuals and their surroundings (Duffy & Jonassen, 1991; Jonassen, 1999; Jonassen, 1997).

Situated cognition is an alternative perspective for understanding learning which may be seen to function within a constructivist framework. In this case situated means positioned. Something is said to be situated in as much as it is positioned between self and other in the world of social affairs (Cobb & Bowers, 1999). In situated cognition, investigators set out to reveal how persons act within complex social and material contexts. These investigators stress the significance of placing the learning experience in a real-world situation (Kirshner & Whitson, 1998). "Situated activity", according to Lave and Wenger (1991), implies an "emphasis on comprehensive understanding involving the whole person rather than 'receiving' a body of factual knowledge … and on the view that agent, activity, and the world mutually constitute each other" (p. 33).

In situated cognition there is a dialectic relationship which exists between knowing and doing. Learning activities and the context in which the learning activities are carried out have a significant impact on cognition and learning (Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995). Instead of traditional understanding developed through learning structured and decontextualized knowledge in the classroom, in situated cognition learners acquire their understanding through concrete and authentic learning tasks, that is, contextualized tasks. This context, along with the culture that defines it, exercises great influence on the kind of learning engaged and fostered within it (Carr, Jonassen, Litzinger, & Marra,, 1998). Thus, fundamentally situating learning and cognition provides a circumstance which co-produces knowledge through activity (Brown et al., 1991).

In addition to context and culture, our understanding of things is influenced by other components accompanying learning activities. Those components include the authenticity of learning activities, overt psychomotor and verbal exchanges between mentor/instructor and learner/student with regard to problematic cases, and the feedback the student receives from the instructor in the process of learning (Brown et al., 1991; Lave & Wenger, 1991; Choi & Hannafin, 1995; Jonassen, 1997). Cognitive apprenticeship, enculturation, and collaboration all call for learning that mostly happens in the concrete, dynamic, and face-to-face environment of situated cognition. It is thus logical to expect that the construction of individual knowledge is strongly influenced by the interaction between the learner and those that are an inseparable part of learning activities in authentic situations. As Bransford, Brown, and Cocking (1999) point out, recent work in social psychology, cognitive psychology, and anthropology supports the view that learning and transfer are influenced, in a powerful way, by the particular settings in which learning takes place.

The generally accepted components of situated cognition are seen to be learning in context, authenticity, enculturation, cognitive apprenticeship, collaborative learning, and scaffolding (Barab & Duffy, 2000; Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995; Lave & Wenger, 1991; Wilson & Myers, 2000).

Context

It is believed that knowledge is "a coproduction of the mind and world" (Hung, 2002, p. 394). A person interacts with the environment, which consists of various affordances that provide the cues necessary for this person's perception (Altalib, 2002). Jonassen (1997) argues that the description of the context in which a problem occurs functions as an essential part of the problem representation because the same problem appears differently in different social or work settings. Choi and Hannafin (1995) contend that learning is a "natural by-product" of the relationship between individual and environment, or the by-product of the individual learners who are engaged in the contexts in which the knowledge is embedded. Additionally, context is described as the "simultaneous interaction of a number of mutually influential factors" (Tessmer & Richey, 1997).

Learning, regardless of which form of learning, is situated in some context or culture (Brown & Duguid, 1995). That is, learning is affected by the context or culture in which the learning takes place (Carr et al., 1998). Hanks (1991) maintains that "meaning, understanding, and learning are all relative to actional contexts" (p. 15). The school of situated cognition emphasizes the role of context in learning, thinking, and knowing. Because of the uniqueness of each problem in real life, it is often the case that a learner experiences difficulties in the process of solving a problem when s/he confronts a similar problem in another context (Bransford, Brown, & Cocking, 1999). For example, some Brazilian street children calculated totals and change speedily and correctly when their sales required such calculations, but they could not solve similar calculation problems in the context of a school classroom (Carraher, 1986; Carraher, Carraher, & Schiliman, 1985).

Each time a learner tries to solve a problem, s/he may encounter some unexpected difficulties or new variables even though the problem may be similar to ones s/he solved previously. "New situations and activities inevitably recast" the meaning of a word, a concept, a principle, or a law in a new and more "densely textured form" (Brown et al., 1991, p. 33). The learner has to find and utilize different strategies and tactics to cope with and solve a seemingly similar problem in different contexts.

In transferring knowledge between different contexts, it is believed that situated cognition promotes learning through problem-solving practices so that learners are more likely to abstract relevant features of concepts to develop a flexible representation of knowledge because "significant aspects of the problem space emerge in the process of working on the problem" (Greeno and the Middle School Mathematics through Application Project Group, 1998, p. 7). As Brown et al. (1991, p. 37) note: "knowledge comes coded by and connected to the activity and environment" and some components of knowledge are in the mind while others are in the physical, conceptual, and cultural settings where knowledge is developed.

Along with experiences accumulated from learning in various contexts, the learners become skillful and sophisticated, developing an ability to "understand when, why, and how to use various procedures, concepts, and skills" (Cognition and Technology Group at Vanderbilt [CTGV], 1992, p. 77) for problem solving. They are able to do so because they keep reconfiguring information through their numerous and repeated encounters of similar problems in different occasions. Bransford (1994) maintains that expertise and wisdom are acquired through the accumulation of experience in various real life settings, rather than through abstract learning.

Context, therefore, may be seen to be "complex, multifarious, and enveloping" and a context is not the "additive influence of discrete entities but rather the simultaneous interaction of a number of mutually influential factors" (Tessmer & Richey, 1997, p. 87).

Context in computer-based instruction

Computer-based instruction is able to provide learning activities in various settings that can be close to as real and dynamic as experiences in real life through its embedded features and tools. These can be used to provide vicarious experiences for the students.

Computer-based instruction is an increasingly important part of instruction based in information and communications technology. It is used to accomplish many things in education that could not be done or that were difficult to do before. Computer simulation, for example, can represent real-life situations that allow effective and authentic learning. Kinzer, Sherwood, and Bransford (1986) describe a computer simulation entitled "Odell Lake" for students in grades 4 through 6 in the United States. As an ecological simulation, Odell Lake presents a variety of situations that may occur in nature. The student plays the role of a particular type of fish living in Odell Lake. The situations include the invasion of other fish into the student's territory, the types of food made available (natural or bait), and the entrance of non-fish predators. As a fish, the student must react to the changing situations.

In this and other person-computer interactions, Kinzer Sherwood, and Bransford (1986) suggest that a more equal partnership may exist between student and computer in computer-based instruction than is typical between a teacher and a student. Kinzer Sherwood, and Bransford believe that while learning with computers, a student is more actively engaged in learning. The student either makes decisions about how to interact within a game or simulation or else uses the computer as a tool to acquire and shape information. The computer, in turn, can let the student know whether his/her decision is judged appropriate in a specific situation and gives him/her the opportunity to adjust decisions or interactions in light of the results from the computer. In Odell Lake, for example, immediately after the student makes a decision the computer produces results to inform the student (fish) whether his/her response was appropriate in the context of the specific case.

Again, using Odell Lake as an example, after informing the student of the appropriateness of his/her reaction, the program may provide a new case for him to work on. Some conditions in the new case are changed while the others remain the same as they were, thus a different context is provided to the student. The student now has more opportunities to make mistakes and learn from them (Kinzer et al., 1986).

In addition to the above-mentioned merits, there are other embedded features and tools (such as hyperlinks to other resources or the animation that dynamically displays ideas.) that enable computer-based instruction to represent some of the learning activities that are contextual and that cannot be easily provided in conventional classroom learning environments. Utilizing the features inherent in computer-based instruction we can represent key concepts through audio or still and motion visual displays, as well as text to engage learners in learning activities in varying contextual learning environments. The learning task in visualized, yet changing contexts may possibly raise the learners' attention to and interest in learning the nuances of a particular concept in several contexts. McGinn and Roth (1999) note that multimedia is able to represent "pictorial or graphical inscriptions of important aspects of the phenomena" (p. 21) that are under study. The "readable, presentable, moveable, and combinable" representation, according to McGinn and Roth, provide "attentional and conversational foci" (p. 21) under which practitioners accomplish their task. Grabe and Grabe (1996) point out that meanings or ideas can be understood more easily when they are "portrayed in realistic video, when heard, or carefully outlined in text."

Multimedia in computer-based instruction, therefore, can more easily put difficult and sometimes confusing English words, tricky mathematics problems, or abstract theories into concrete settings with a great deal of background information. After making use of many clues embedded in information-rich and varied representations, the learners are able to take into consideration the irregular variables which might be described as the factors that affect the evolution of the things in a particular situation but that are often overlooked or unable to be presented in traditional print media. The once difficult, tricky, and abstract learning task now becomes relevant, concrete, comprehensible, and attainable. It is claimed that learners are able to learn more effectively with dynamic visual displays than they can with static or text-only visual displays (CTGV, 1992; Szabo & Poohkay, 1996).

Authenticity

Authenticity in this context refers to the genuine activities taking place in real-life settings. It means that the learners participate in "actual experience (contextualized) rather than being external (decontextualized) to the event" (Altalib, 2002, p. 4). Specifically, authenticity deals with the issues or problems arising from actual work, or activities that need be dealt with or resolved. Jonassen (1999, p. 221) sees authentic activities as any learning tasks that "replicate the particular activity structures" of the real world. Authentic learning, therefore, represents the same type of cognitive challenge found in the real world (Savery & Duffy, 1995). Authentic learning thus involves the accomplishment of activities that are commonplace in the daily problem- solving situations of just plain folk (JPF), practitioners, and experts (Brown, Collins, & Duguid, 1991; Choi & Hannafin, 1995; Wilson, 1993).

A striking difference between traditional school students, JPFs, and practitioners is the location where learning activities (problem solving activities) are conducted. At school, students are traditionally engaged in classroom learning from textbooks and other forms of instructional materials. These materials have been edited, and simplified to 'better suit' the students. On the other hand, the JPFs or practitioners deal with problems occurring right in their work or lives. Those problems appear as they are, with no human manipulation to simplify them or make them easier to solve. Often, real life problems seem in disorder and are accompanied by a lot of noise. Noise in this case may be seen as those things that obscure or distort our understanding of the problems. People have to look at the noisy and disordered problems closely to find solutions and resolve them. The processes of solving these problems may appear informal, but they are nonetheless "full-blooded, authentic activit[ies] that can be deeply informative in a way that textbook examples and declarative explanations are not" (Brown et al., 1991, p. 35).

Advocates of situated cognition promote engaging the learners in real-world problem solving as is the case with JPFs and/or practitioners. More than simply acquiring factual knowledge and applying common sense to problem solving, students need to know how to use their knowledge and they need to know why they care about knowing. In other words, they should have ownership of the problem or learning goal (Jonassen, 1999; Nelson, 1999; Schank, Berman, & Macpherson, 1999). With ownership, learners feel a problem to be genuinely theirs and see it as worthy of their efforts. In theory, then, they consequently feel the necessity, obligation, and motivation to solve the problem as the solution will make a difference in their learning and work. Often hands-on, concrete, relevant learning activities enable learners to acquire such ownership and to subsequently derive personal understanding.

In order to have students access and deal with real life problems more easily, the real life problems are sometimes incorporated into the problems in textbooks. The problems are presented as more living examples for students to refer to for the development of their problem-solving ability. Because of the nature of print (i.e. static, silent, monochromatic), many dynamic and living elements and much of peripheral information from the living world are lost in print representation.

An alternative could be to take students to a variety of settings outside the classroom for problem solving. This may well allow them to witness, own, and consequently solve real world problems. Yet it is often too costly to do so. It is also often the case that a great deal of time is needed for a novice to really become immersed in a new setting. Practitioners or JPFs may exclude an outsider from working on problems because the outsider is seen to lack legitimacy, that is, an ability to truly understand the nature of the problem (Lave & Wenger, 1991). One needs time to become familiar with a new environment and to get accepted by the old-timers there. In addition, certain problems do not occur frequently, making timing difficult.

Even if time is sufficient for students to learn in real life through problematic cases, and legitimacy is not an object, problematic cases themselves are not always available. One cannot always be in the right place at the right time. Chances are, the problems available at a given time may not be what the students need to advance their learning. Moreover, there are tasks that involve too much danger or risk to actually let novice learners perform, such as surgery or flying an aircraft (Schank & Cleary, 1995). For novice principals, too, simply jumping into real-life problem solving may involve risks that need experience to avoid. Taking students to real-life settings, therefore, may not be the most productive way to provide authentic learning.

Schank and Cleary (1995) suggest that when it is too expensive or dangerous to allow students to actually try out the roles they want to learn, realistic experience may be provided through simulations. "When it's not feasible to create real-life situations in which learners can engage in the tasks they want to learn," Schank and Cleary argue, "simulations must be created that effectively mimic those situations so well that they prepare the student for them without actually having them to be in them" (p. 77). With this in mind I will now examine the use of authenticity in various forms of computer-based instruction.

Authenticity in computer-based instruction

Using computer-based instruction authenticity could still be reached without learners going to the actual site to do their work or to participate in the activities. Therefore, no legitimacy issue is involved. Equally significant is that computer-based instruction can provide students with designated problematic cases in the right place at the right time, or as is popularly said 'on demand'.

Authenticity means at least two things: a similarity between problems posed in the classroom and those found in the world outside the classroom; and the degree to which the problem and all relevant features of the environment are faithfully replicated in the classroom. In computer-based instruction, features of modern technology can represent the issues and problems exactly as they present themselves in real-life settings, allowing learners to deal with or resolve issues and problems as they do in real life. Further, if all of the details and nuances of the problem and its context are carefully replicated, the problems represented in computer-based instruction can be as complex as they are in real life. The idea is to provide learners with vicarious experiences which resonate with their understanding of real life. In such simulations the learners, though not learning face-to-face, can still communicate with each other and with instructors. They can still ask questions and seek help, and they can still comment on peers' work. Learners can do so in a computer-based learning environment because of the multimedia features capability of the technology. The Jasper Adventure Series, created and implemented by Vanderbilt University's Cognition and Technology Group (CTGV, 1992b), and the SOCRATES curriculum by Honebein (1996) are other good examples of applying computer technology to authentic learning.

Computer-based instruction is appealing to many educators because it includes digital video. Digital video can simulate real-life situations and, additionally, the computer program can have hyperlinks that connect to various relevant information resources. Such programs can also provide space for learners to exchange their learning experiences and to communicate with instructors for feedback and advice. Computer-based instruction thus potentially enables a similar conversational and interactive problem-solving process as may be undertaken in real life. Learning conducted in computer-based instruction environments can consequently be authentic, meaningful, and fruitful. In this regard, the Jasper Adventure Series, created and implemented by Vanderbilt University's Cognition and Technology Group (CTGV, 1992a, 1992b) is a good beginning example.

In each episode of the Jasper Adventure Series, video presentations are used to offer believable stories with interesting characters, complex and important challenges, as extensions to a variety of curricular areas (Learning Technology Centre, Vanderbilt University, 1992b). The stories are embedded in "realistic macrocontexts to create some of the advantages in context learning" (CTGV, 1993, p. 52) so that the gap between the natural learning environments created by the stories and school learning environments is bridged and teachers, as well as students, can explore and make sense out of the data from the stories.

Schwartz, Lin, Brophy, and Bransford (1999) discuss the implementation of SMART model of instruction and assessment under the shell of STAR LEGACY. The SMART stands for "Scientific and Mathematical Arenas for Refining Thinking" and STAR LEGACY is a software program designed "to promote research on the design of flexibly adaptive instruction" (p. 188). While the SMART model aims to "make instructional settings and students' prior knowledge as homogeneous as possible" (Schwartz, Lin, Brophy, and Bransford, 1999, p. 211), it is to implement the STAR LEGACY's aspects of "multiple learning cycles that help people progressively deepen their understanding" and "reflecting on the overall learning process and creating LEGACY products for others to use." (p. 189) It is hoped that student learning will progress from problem-based learning in which data and issues are readily available to "more open-ended project-based learning" in which students will find issues to resolve and search for data to make use of. In one unit under the SMART model, for example, Schwartz et al. (1999) present the problem of "The Stone River Mystery" through a video presentation. Students must solve the mystery by consulting knowledge resources, sharing ideas with peers or experts, and assessing and revising their understanding of the mystery. The students are to decide whether pollution exists in the river and, if it does, what kind of pollution it is and where it comes from. The students have to learn such concepts as sampling, indirect causal effects, ecosystems, and the relation between oxygen and water pollution in order to understand and share an understanding of water pollution. Further than that, students must plan and conduct a similar project at another site upon the completion of the Moon River Mystery. As a result, the students' understanding will be deepened through reflecting on the overall learning process and at the same time a LEGACY product is created for others to use Schwartz et al. (1999).

The SOCRATES curriculum is another computer-based learning model. It is an example of authentic learning through computer-based instruction (Honebein, 1996) incorporating graphics, audio, and video clips into learning activities. This program aims to train second year medical students to care and manage patients with diabetes mellitus. In one learning activity, a group of students acts as a physician who is presented with a diabetes patient with a blood glucose problem. After diagnosis, the students modify the patient's medication, diet, and exercise to "optimize the patient's blood glucose profile," all through computer simulation (Honebein, 1996, p. 18). The students monitor the graphic of the patient's blood glucose levels for a simulated two day period, until the final result becomes apparent. Through an analysis of the result, the students physicians identify the merits and weaknesses of their treatment recommendations.

Some of the merits of the SOCRATES learning model are: The cost is less than in a real world experience, and it also takes less time. Any modification the student physicians make in the existing medication results in changes in the simulated patient's condition. Learning in this circumstance is meaningful and effective. The transfer from such robust and meaningful learning to the learners' real-life problem solving often appears superior to that of traditional learning models, as has also been found in the Jasper Adventure Series (CTGV, 1993).

Of particular interest for this project is Project Decide, a simulation of the work of principals at the University of Alberta, has made a good attempt. Project Decide (the Aberhart Junior High School simulation in particular) uses multimedia including video, text and graphics to simulate problematic cases from real life for students to resolve (Mappin, 1996; Maynes, McIntosh, and Mappin, 1993). The technology is able to bring to the classroom a sense of reality. Because it is a real life simulation, and because it requires the students to deal with various issues as they often see/experience in their life, the simulation may lead students to experience "a feeling of déjà vu – of having been there before and of being thoroughly familiar with all of its details" (Lincoln & Guba, 1985, p. 214). It must be pointed out that these feelings of déjà vu may not be limited only to those who have personally dealt with similar issues, but also those who have indirectly dealt with them, those who watched or heard of how similar issues were dealt with by their colleagues, their subordinates, and/or their superiors.

Authentic learning activities, such as those in Project Decide, the Jasper Adventure Series and the SOCRATES curriculum, enable learners to have first-hand experience solving complex problems in the real world. This provides a different learning experience than that which can be provided in a textbook that is abstract and often simplified. Learners in computer-based learning experiences are able to reflect on the process of problem solving and can ponder why certain things are to be done while others are not, often in response to emerging problems in a particular situation.

Moreover, a great motivational potential is also involved when engaging learners in authentic learning activities because the success of their decision or action (or the lack of it) could be immediately seen by peers as well as by the learners themselves when the decision or action is posted in a computer conference or shared in class (Choi & Hannafin, 1995). The learners, like most people, want to do well and want their peers to know that. They will try their best to make good decisions to win others' respect.

Enculturation

Enculturation is "considered a lifelong learning experience in which cultural awareness and understanding develops" (Zimmerman, Ramirez-Valles, Washienko, Walter, & Dyer, 1996, p. 296). It is a process through which individuals learn what counts in a particular discipline (Newton & Newton, 1998). In the context of the proposed studies, enculturation is a novice learner's process of learning and assimilating the dominant beliefs and values of the expert practice of the community.

Learning in a community or organization, learners interact with the values, norms, and dominant practice in the community or organization (Altalib, 2002). In situated cognition learning is a process of active individual construction and a process of being immersed into, and assimilating and accommodating to the culture of the community (Cobb, Gravemeijer, Yackel, MaClain, & Whitenack, 1997). Consciously or unconsciously, we are under the constant influence of the people around us while we, too, influence them. There is a very popular saying: "like father like son." A boy is often convinced by his parents, siblings, and people outside his family to talk and behave like a man such as his father. Otherwise, he would be looked down upon and possibly be scorned. Growing up in such surroundings, the boy will likely strive to talk and act as a man does. He may look up to his father as some kind of hero. He observes his father, and adopts his words and deeds wherever possible. Gradually, he not only looks like his father but also acts as he does as well.

A person in any community is shaped by the environment s/he is in just as a child is, shaped by his/her family. To a large extent, people in a community or a nation share some common features that are uniquely possessed only by that group of people. This is so because the people adopt, consciously and unconsciously, the dominant values and beliefs of the community or the nation. A community, Calderwood (2000) notes, is "constituted, sustained, enriched, and transformed by the relationships and shared meanings among its members" (p. 6). Brown, Collins, and Duguid (1995) found that people pick up jargon, imitate behaviour, and gradually start to act in accordance with societal norms. Why? Because there is an intimate connection between the special environment that human beings inhabit and the fundamental, distinguishing qualities of the human psychological processes (Cole & Wertsch, 2000). It is culture - the way people talk, dress, and behave in a shared value system - that serves as a basis for mutual understanding.

Because of our diverse backgrounds, we often hold different views toward things. Difference means there is some distance between, an incompatibility or gap. Reconciliation, therefore, is necessary to eliminate that distance, to mediate the difference or to bridge the gap so that it becomes compatible or channeled (Jaworski, 2000). The mediation takes place between us as members of a community, that is, among all those who are concerned with or affected directly or indirectly by the incompatibility. We negotiate new positions for shared meanings through discussion or argument. We try to find common ground that is mutually acceptable. This is the process of social mediation of individual knowledge. Such negotiation is a genuine offering of individual perspectives and meanings for consideration by others (Jaworski, 2000). It involves making an effort to listen to, observe, and understand other perspectives. In the long run, we all become accustomed to the take-and-share way of knowing and expect the same from others. A culture is thus in the forming (Jaworski, 2000).

Dewey has long pointed out an external influence on internal meaning construction:

> ... we live from birth to death in a world of persons and things which is in large measure what it is because of what has been done and transmitted from previous human activities. When this fact is ignored, experience is treated as if it were something which goes on exclusively inside an individual's body and mind. It ought not to be necessary to say that experience does not occur in a vacuum. There are sources outside an individual which give rise to experience. (Dewey, 1938, p. 39)

Small wonder that Rorty (1979) claims we are all influenced by our own culture and experience.

Vygotsky attributes the cognitive development of an individual to the individual's social interaction within the environment. He argues that consciousness exists in socially meaningful activity. We know ourselves through our interactions with others:

> The mechanism of social behavior and the mechanism of consciousness are the same… We are aware of ourselves, for we are aware of others, and in the same way as we know others: and this is as it is because in relation to ourselves we are in the same (position) as others are to us.
> (Vygotsky, 1978, p. 30)

The view that consciousness and cognition are 'socially shared' or 'socially distributed' rather than being attributes or properties of individuals has been increasingly accepted in educational research (Cobb & Bowers, 1999; Resnick, Levine, & Teasley, 1991; Salomon, 1993).

Cobb and Bowers (1999) maintain that in every discourse we are positioned with regard to circumstances in the area of social affairs. Individuals are participants in the practice of meaning construction, which occurs through personal experience, interactions with others, and interactions with material and representational systems (Cobb & Bowers, 1999; Greeno, 1997). Therefore, instruction takes place in complex social environments and anything we do, such as learning or problem-solving, is both social and individual (Greeno, 1997).

Lave and Wenger are advocates of the social construction of knowledge and put forward the notion of community of practice. They argue that: "Activities, tasks, functions, and understandings… are part of broader systems of relations in which they have meaning" (1991, p. 53). Barab and Duffy (2000, p. 36) depict the characteristics of the community of practice as "a common cultural and historical heritage; an independent system; and a reproduction cycle" that enables community members with shared goals to construct a "collective knowledge base" through negotiation and renegotiation. The learners in this community of practice undergo "some type of individual transformation" that leads to the change of their individual identity (Henning, 2004, p. 145). This is a dialectical process, a process of changing of the guard. Over a period of time and through deeper participation in this community of practice, newcomers become increasingly associated with this community of practice and its members, and can become old timers and the community can maintain itself (Henning, 2004). The essence of the community of practice is to locate learning in the processes of social co-participation (Hanks, 1991; Lave & Wenger, 1991). Members of the community of practice need be engaged in the meaning construction such that it "engenders a level of commitment to the community and its members" (Schwier, Campbell, & Kenny, 2004). The concept of the community of practice thus presents a paradigm shift, from the traditional focus on an individual learner's acquisition of knowledge in isolation to the learners' co-participation in the social world with shared membership (Barab & Duffy, 2000; Greeno, 1997; Lave & Wenger, 1991; Wenger, 1997).

Jonassen (1997) thinks it important that learners investigate values, beliefs, socio-cultural expectations, and customs of the community in which they will learn and work and those of the people with whom they will work. Individual learners participate in the knowledge construction of the community of their practice. This construction, however, is not done from a zero base, it builds on what had been done before. Exposed to an authentic learning environment where practitioners or JPFs work, the learners, seeing their own limitations in carrying out learning practices, would likely look around for factors that will affect the successful accomplishment of their learning task and would learn to appreciate and use these factors. Wenger (1998) notes that "meaning is not preexisting, but neither is it simply made-up. Negotiated meaning is at once both historical and dynamic, contextual and unique" (p. 54).

Initially, learners may feel the community's rules and behaviour expectations imposing, "artificial, or even unnecessary" (Barab & Duffy, 2000, p. 38). In spite of their diverse backgrounds, the learners will most likely start to learn from and act in the same way as the practitioners and JPFs because it is they who make things happen in an ill-structured world, a confusing world, when things appear as they are with no or minimum structural simplification and sometimes an appearance of chaos. Through their trajectories of participation, the learners develop identities that are shaped by the activities in which they participate (Greeno, 1997; Wenger, 1997). The learners come to accept the historical context and the necessity and importance of socially negotiated norms that define both community and their own identities. The learners start accommodating other people's views and ideas (Barab & Duffy, 2000). By and by, they adopt and actively promote the dominant values in the community, contributing to the knowledge construction of the community of practice. Carr et al. (1998) contend that learners become sophisticated by examining what is performed and valued in the culture in which learning occurs. It is through this extended participation in a community of practice that a newcomer grows into an old timer.

Enculturation and community of practice in computer-based instruction

Enculturation can take place in computer-based instruction. In a computer-based instruction environment, for example, the tools of conferencing, chat, and hyperlink may be used to create the community of practice, including the culture in which practitioners and JPFs negotiate meanings and solve problems (Herrman, 1998). Most importantly, things happening in this computer-based learning environment may represent how individual community members, newcomers in particular, interact with their surroundings and how they immerse themselves in the culture. Participants could appreciate the strategies and tactics practitioners or JPFs apply to problem solving, and will learn to cope with various problems as the practitioners or JPFs do.

Computer conferencing, chat, and hyperlinks have all been widely adopted in computer-based instruction as a means for participants to share their ideas or to raise issues or items of interest. Learners of different backgrounds and skill levels read, comment, debate, and/or reflect on the posted works, raised issues, and/or items of interest. The computer tools thus serve as a venue where different ideas and thoughts converge and are studied, debated, and reflected upon.

As the learners' participation in and familiarity with the online learning activities grows, a synergy evolves and they become a part of a learning community. Along with the learners' closer involvement with the learning activities and their appreciation for the computer-based learning community, a sense of learning community becomes rooted in the participants.

Scardamalia, Bereiter, and Lamon (1994) describe a learning community as one in which the goal is to advance the collective knowledge such that it supports the growth of individual knowledge. In such a computer-based learning community, members know who has the relevant expertise to address a given issue or problem when such an issue or problem is presented (Bielaczyc & Collins, 1999).

Herrman (1998) describes his experience of participating in the activities of an online community. The members of the community were linked through a listserv and the participants communicated with each other by email. The community came into being out of the "genuine desire" for a small group of practitioners and theoreticians "to sustain their working relationship" (p. 18).

In spite of the conflicts and disagreements, participants in the online community used civil language to engage in debate, to express their hesitation and frustration, and to support or oppose other ideas. The merit was obvious. The online learning "makes real the possibility of intellectual excitement many times over: as horizons expand, as new 'half-baked' ideas are risked into words, and as the possibility of witnessing new knowledge in the making is realized" (Herrman, 1998, p. 22).

In this online learning community, like in real-world learning communities, newcomers read the works posted by the experienced participants, observing how they comment, debate, critique, and solve problems online. Novice participants also learn the language used by the experienced people, and learn to appreciate the dominant values and beliefs in the community. Before long, the novice learners become familiar with the online culture and they become increasingly involved in activities while using the language and even the jargon they pick up through observation. They apply the strategies and tactics to read, comment, debate, critique, reflect, and solve problems. Through practice they become experienced participants themselves, resembling closely their more experienced counterparts. For example, Herrman recalled that he himself started from “silent participation” and “side-channeled communication” in the online community (p. 17). Over time he began voicing his ideas, writing his comments, and even writing an article on the listserv.

Herrman's recollection illustrates how a novice could advance from a peripheral participant to a full participant in a computer-based community of practice. Yet, the community that Herrman discussed was not dealing with situated cognition. It did not take place in a simulated learning environment either. On the other hand, the experience of the students in the Project Decide simulations has illustrated, though in a limited way, how the participants were enculturated into the community of Aberhart Junior High School.

As has been described, the course was a computer-based simulation course on principalship. In this graduate course the students were required to work as the principal of Aberhart Junior High while resolving issues. The students had to actively make use of all available resources for decision making just as a real-life principal does.

Through accidentally occurring and deliberately organized activities in the simulations and through some other activities that were outside the simulation but a part of course, the students were able to "suspend disbelief" so they could make their decisions "in an intense, interactive human milieu" and consequently, to "imagine their way vividly into the role created for them" (McIntosh, Maynes, & Mappin, 1989, p. 3; p. 4). Working in this simulated school community the students derived a sense of responsibility. Cobb and Bowers (1999) observed that "to learn is to participate in and contribute to the evolution of communal practices" (p. 10).

Apprenticeship and cognitive apprenticeship

Authentic learning is promoted in situated cognition. However, trying out new things, as authentic as they may be, can be a slow and frustrating way to learn if the novice learners do it on their own. "It can lead to bad habits or failure to synchronize actions," noted Schank and Cleary (1995, p. 76). Novices need someone to look over their shoulders as they take on new roles. They need someone with experience to interrupt, provide challenges, encourage risk-taking, and guide (Schank & Cleary). In crafts, for example, there are masters and apprentices. Craftsmen learn their skills by observing, mimicking, and being instructed and corrected by skillful people around them, mostly their masters or mentors. An apprentice learns to approach problems and deal with them by following the master's example. In the process of observation, being coached, and through practice, the apprentice receives scaffolding and becomes progressively independent (Choi & Hannafin, 1995; Winn, 1993). Dreyfus and Dreyfus (1986) note that knowledge is grounded in habits formed by successful coping. Apprentices observe and mimic the practitioners and their peers for knowledge and skills. They start as novices to perform a given task through trial and error under the guidance of their master. They progress and gradually become competent, proficient, and expert at the task.

Lave and Wenger (1991) discuss their research on craft apprenticeship in West Africa. They note that the Vai and Gola tailors in Liberia learned their skills without going to school for formal training. Those apprentices, according to Lave and Wenger, learned their skills through "a common, structured pattern of learning experience" that did not require them to be formally taught, to take examination, or to mechanically copy their master (p. 31). Yet, most of those tailor apprentices became skillful and respected master tailors themselves.

Craft apprenticeship is a typical example of learning by doing and has proven to be a successful teaching approach that experts employ to teach various tasks in different contexts (Brown et al., 1991). Dreyfus and Dreyfus (1986) note that initially, the novice learner copes with a problem with rules acquired in context-free environments. S/he gradually reaches the stage of expert and can view a problem in context and solve it intuitively and with deliberation, that is, through "critically reflecting on one's intuitions." (Dreyfus & Dreyfus, 1986, p. 32) When encountering a situation that the skillful master/mentor never experienced before, the master/mentor might approach it intuitively, without questioning whether there are any alternatives. In this regard, cognitive apprenticeship appears more effective.

Cognitive apprenticeship is the relationship between an apprentice/learner and a master/mentor that involves cognitive exchanges. It is a process of social interaction through which learners, as cognitive apprentices, grow from peripheral participants into full participants through participating in the community of practice (Altalib, 2002; Lave & Wenger, 1991). In most instances today psychomotor exchanges take place in craft apprenticeships where the apprentice/learner and master/mentor interact in the process of learning/supervision. The significance of cognitive apprenticeship, however, lies in its emphasis on teaching students how to learn, how and why to approach and solve a problem. The goal of cognitive apprenticeship is to initiate the apprentice/learner into the expert community of practice (Brown et al., 1991; Lave & Wenger, 1991). The essence of cognitive apprenticeship, according to Brown et al. (1991), is to "promote learning within the nexus of activity, tool, and culture" (p. 39) in a community of practice.

At university, for example, graduate students are usually directed by advisors and/or supervisors. We observe the mentors and mimic them. When we write academic papers we ask the supervisor/advisor for comments. In the case of a candidacy exam, graduate students' proposals are read and commented on by the advisors/supervisors before we present them in front of the committee. This is because the mentors recognize an acceptable proposal for the specific field of the academic community of practice. They have experienced the process. They have themselves been apprenticed, informally, and afterwards supervised it. As well, peer review is the foundation of validity in the social sciences. All these, to a large extent, suggest a cognitive master/apprenticeship relationship.

An important characteristic of cognitive apprenticeship is its promotion of more overt thought processes which the apprentices undertake during their observing, mimicking, being instructed and corrected. At the same time, an overt thought exchange process often occurs between apprentices/students and masters/teachers. It is a dialogue between them regarding what is being learned/taught, particularly on those "problematic and especially difficult cases" (Lave & Wenger, 1991, p. 108). Such a dialogue, at times, may start the apprentices looking at their own thought path, comparing it to the mentors, identifying the pros and cons, and then addressing them accordingly. A cognitive apprenticeship, therefore, is able to lead the apprentices to a form of metacognition.

Dialogue provides more opportunities for the exchange of thoughts and ideas between mentors and apprentices and between the apprentices themselves. (Brown et al., 1991; Choi & Hannafin 1995; Collins, Brown, & Newman, 1989; Lave & Wenger, 1991). It makes the problematic or especially difficult cases more comprehensible and addressable. The novice learners need to talk to the practitioners/masters to get a sense of how expertise is manifest in activities and conversation (Brown et al., 1991).

It is advocated, therefore, that frequent interactions between the student and mentor be conducted on problematic cases and on points of interest (Barab & Duffy, 2000; Brown et al., 1991; Choi & Hannafin, 1995; Lave & Wenger, 1991; Wilson & Myers, 2000). Scaffolding and other kinds of help from the master and other more capable peers would substantially advance the student's abilities to know and do, abilities that might be otherwise remain undeveloped. In this thought exchange process the teacher, rather than being an expander of knowledge and skills, is increasingly a co-learner and coach. This is especially so in the area of science and technology studies where the subject matter is changing at an accelerating rate and in the social sciences, as well, with its complex web of human relationships, history, and shifting global alliances.

In the face of social and technological changes, teachers and students are in a similar position. Teachers, like students, learn new things to adapt to new and changing situations. They, like students, are learners who must go through learning processes. In this situation of social and technological change, the teachers are no longer experts but co-learners (CTGV, 1993). However, their experience of teaching, their accumulated learning experiences, and their professional training enable them to provide encouragement, guidance, and support that is unique and many times decisive in facilitating student learning.

Cognitive apprenticeship has been used in education. Student teachers, for example, are paired with experienced in-service teachers to develop the skills of teaching and their understanding of what it means to be a teacher. In a similar vein, counselor trainees gain their experience under the guidance of their supervisors during internships. In the apprentice relationship student teachers not only learn how to do things they ask questions and learn why things are done the way they are. Sometimes they may ask their mentors to explain why they deal with certain matters in a given manner and whether any alternatives may be implemented. Occasionally student teachers may take problematic cases to their professors back at the university for assistance. In addition to simple mechanical observation and mimicking in the manner of craft apprenticeship there is an overt mentor exchange between student teachers and in-service teachers, and to a certain extent with their university professors (Schunk, 2000).

"Cognitive apprenticeship methods," Brown et al. (1991) point out, "try to enculturate students into authentic practices through activity and social interaction in a way similar to craftsmanship" (p. 37). Brown et al. recommend three steps when cultivating a novice into an expert through cognitive apprenticeship:

- making explicit the master's/teacher's tacit knowledge, or modeling their strategies for the cognitive apprentices engaged in authentic problem solving;
- supporting (i.e. scaffolding, coaching,…) the apprentices' attempt at solving problems; and
- empowering the apprentices to carry on independently. (Brown et al., 1991)

Cognitive apprenticeship in computer-based instruction

Computer-based instruction offers great potential for creating a learning environment which uses cognitive apprenticeship. Instead of physically being there, the mentor/master can communicate with a student/apprentice through electronic means. Through online tutorials and mentorship via email, ongoing electronic feedback from experts, frequent synchronous and asynchronous communication, and scaffolding, plus multimedia visual examples, computer-based instruction is able to create an authentic learning and apprenticing situation (Bonk & Reynolds, 1997).

In his one-week long workshop for the SOCRATES curriculum, Honebein (1996) uses the computer-based simulation discussed earlier to represent a patient with a blood glucose level problem to second year medical students. The process is presented in several video clips. These clips show how an experienced physician examines a diabetes patient in an authentic situation and what he prescribes for the patient. While watching the online video clips the students or preceptor can stop it at problematic points or at points of interest and discuss them. There are embedded hyperlinks connected to other video clips containing interviews with the patient or with the expert physician. In the interview, the patient may talk about his/her feelings about the treatment, or the expert physician shares with the students his rationale for adopting certain procedures or tactics to treat the patient. At the same time, the procedures and tactics in question may be replayed so that the students can watch them more closely while reflecting on the physician's rationale and the patient's experience.

After watching the video clips the preceptor, together with the students, reviews the prescriptions that the students wrote earlier for the diabetes patient. The preceptor analyzes the prescription against that of the expert physician. He makes comments on the students' prescription then discusses their approach to the question of prescribing for the patient. He may provide alternative approaches. He may recommend other useful resources for their problem solving (Honebein, 1996). What the preceptor did was not to provide the students with the right answer, but instead lead them to ask questions that an expert problem-solver would ask (Savery & Duffy, 1996; Schoenfeld, 1996).

Proceeding this way, the students come to understand the nature of the problem in a specific setting or in the specific culture they are in. They witness how the experts solve problems. They see demonstrated, both verbally and physically, the kind of knowledge and skills key for an effective practitioner and why the knowledge and skills are essential (Honebein, 1996).

Listening, watching, and reflecting, the students become aware of the sources for knowledge and skill acquisition and the criteria for assessing performance (Honebein, 1996). Then, new computer-simulated cases may be provided for them to deal with while they apply what they have observed or what they have been advised.

In spite of the tools, aids, and advice, as Honebein noted, the students will still encounter the problems of incomplete documents, illegible handwriting, and overabundance of complex data that are confronted daily by practitioners when dealing with new cases. Students will have to think hard, discuss and debate through computer conferencing or email, consult their preceptor via email when necessary, or refer to the expert physician's practices to correctly treat the cases. The dialogues between students and their mentors lends learners more opportunities to think and reflect using similar logic or intuition to their mentors. The follow-up cases allow them to practice for even deeper understandings.

Although the DiaSim workshop in the SOCRATES curriculum is to a large extent a computer-based simulation, it must be pointed out there was a part in the workshop that was done in a traditional, face-to-face manner. For example, a lot of practice of cognitive apprenticeship was provided face-to-face. The preceptor analyzed the prescription, made comments, discussed the approach, provided alternative approaches, and recommended other useful resources. What still needs to be addressed is the feasibility of incorporating such dialogues into the computer-based learning experience and how it will work if this is done.

Collaborative learning

Meaning may not be taken for granted. Learning is located "at the middle of co-participation rather than in the heads of individuals (Lave & Wenger, 1991, p. 14). It is reached through a process of continual negotiation in a social environment that involves individuals accommodating differences (Barab & Duffy, 2000). Because of our diverse backgrounds, we often hold different views toward things. Difference means disparity. It means incompatibility or gap. Reconciliation, therefore, is necessary to eliminate that thing in between, to mediate the difference or to bridge the gap so that it becomes compatible or channeled (Jaworski, 2000). Mediation takes place between us, that is, among all those who are concerned with or affected directly or indirectly by an incompatibility. In the form of discussion or argument we negotiate and renegotiate new positions for shared meanings. We try to find a common ground that is mutually acceptable. This is the process of social mediation of individual knowledge. Such negotiation is a genuine offering of individual perspectives and meanings for consideration by others (Jaworski, 2000). It involves making an effort to listen to, observe, and understand other perspectives. In the long run, we all become accustomed to the take-and-share way of knowing and will expect others to do the same (Jaworski, 2000). Such negotiation is essential in successful collaboration.

In this consideration of situated cognition, collaboration is interpreted as the "construction of meaning through interaction with others and can be characterized by a joint commitment to a shared goal" (Littleton & Hakkinen, 1999, p. 21). It is "a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (Roschelle & Teasley, 1995, p. 70). Collaborative learning is a learning process that emphasizes group or co-operative efforts among learners. It aims to guide students into working together and developing greater "social and intellectual interdependence and a trust in the value, process, and power of civil society" (Bruffee, 1999, p. 87). Hiltz (1995) views collaborative learning as a learning process that "emphasizes group or cooperative efforts" among learners. One of the pedagogical values in collaborative problem solving, according to Nelson (1999), is that it encourages the exploration and analysis of content from multiple perspectives.

Collaboration is common in student learning. Team work has been practiced at institutions of learning for years. In collaborative learning students form small groups to work on a project with each member of the group contributing to the accomplishment of the project. Sometimes instructors assign students to groups to work on a problem. The group members work as partners, sharing their ideas on approaching the problem, discussing possible solutions and alternatives to the problem, and, then, actually solving the problem.

Learning and working collaboratively in a team or a group is promoted because this often results in significant learning gains and increased creativity (Johnson & Johnson, 1990). While contributing to the team project, team members are able to see how peers deal with the same task differently. After seeing that the work is done in ways different from their own, students begin to understand that there are many ways to see and solve a problem. It has been found that in at least one case the transfer of the knowledge of skills acquired through collaborative learning is better than that of the learning in traditional classroom settings (CTGV, 1993).

Vygotsky put forward the well-known concept of the zone of proximal development (ZPD). According to Vygotsky (1978), ZPD is "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Individually, what one is ready to understand may be fairly limited. In a collaborative group consisting of people with diverse experience, talent, and ability, the members' zones of proximal development may overlap. The distance between what the group as a whole already knows and what its members as a whole can't make sense of, that is, the area of what as a whole they can learn next, is likely to be broader (Bruffee, 1999). That is to say, anything that is just beyond people's current ability can be learned with a little help from peers or experienced learners. As a result, one individual learner may be ready to understand a good deal more as a member of a working group than s/he could alone (Bruffee). ZPD thus represents the learning a student may achieve with the appropriate assistance and/or instructional scaffolding (Schunk, 2000).

Learning is many times more effective when it is conducted in collaboration because of collective wisdom and strengths. An individual, regardless of how bright he/she is, is limited in terms of knowledge and skill. On the other hand, when individuals come to work together each brings unique knowledge, skills, and perspectives that complement one another and can contribute to accomplishing the team task. In this regard, Vygotsky (1978) has pointed out: "What children can do with the assistance of others might be in some sense even more indicative of their mental development than what they can do alone" (p. 85). An individual is under constant influence from his/her surroundings. S/he derives meanings not only from his/her own feelings or intuition, but also from peer interaction, evaluation, and co-operation (Johnson and Johnson, 1975).

Similar backgrounds and experiences of learners working on the same project together enables them to have a common ground when starting their learning. Working together allows the learners to develop a sense of community wherein they investigate the problem, pose a hypothesis, explore solutions, make decisions, locate resources, and then address the problem (Nelson, 1999). The learning is thus relevant and learners feel the ownership of it. Nelson notes that collaborative problem-solving honours the importance of ownership, and the relevance of the learning experience. As participants in the community of practice, the learners "share standards of what characterizes worthwhile problems to engage in and what constitutes an adequate or excellent solution of such a problem" (Greeno et al., 1998, p. 10). They discuss the difficulties they encountered while working on the problem and any alternatives that may be helpful. They may pick up things more quickly while discussing and debating with peers than they would individually because they are highly alert to the peers' merits and to their own weaknesses exhibited in the discussions and debates. It is under these circumstances of peer relationship and collaboration that Lave and Wenger (1991) contend that learning can be more effective and efficient, because "where the circulation of knowledge among peers is possible, it spreads exceedingly rapidly and effectively" (p. 93).

Collaborative learning in computer-based learning

Bonk and Reynolds (1997) note that technology, information technology in particular, offers extensive opportunities for collaborative learning. They recommend ten techniques for carrying out collaborative learning in web-based instruction. One of their recommendations is to assign students as learning partners or learning teams. The students in a team share their thoughts and ideas regarding the problems to be solved or the questions raised by their instructor or peers (Bonk & Reynolds, 1997). While working, the team members discuss and determine specific tasks for each member. The teams will then assemble their work, refine it, and post it on the conferencing board for other teams to view and comment on.

Instead of face-to-face conversation the instructor and the students communicate with each other through email, computer conferencing, or other electronic means.

This process of collaborative work, as Nelson (1999) notes, cultivates supportive relationships among students and between students and the instructor as well. Bonk and Reynolds (1997) believe that some interactive activities carried on through computer-based instruction such as panel discussions, student team competitions, symposia, and team concept webs may be the success stories of web-based instruction of the new millennium.

Scaffolding

Scaffolding provides construction workers with a necessary, helpful, and effective tool to accomplish their work. Scaffolding rises, usually, along with the rise of the building under construction, enabling the workers to carry on their work safely and allowing them to move from one spot to another and access the resources necessary for their work. The scaffolding is a temporary support structure which will be dismantled after the building is erected. In situated cognition, scaffolding is a supporting structure, base, or outline for learning. It is the "process through which learning efforts are supported" (Hannafin, Land, & Oliver, 1999, p. 131) by various means. In situated cognition, learners conduct their learning in ill-defined environments, that is, the learning activities are less structured, seemingly irregular, and sometimes chaotic. In such situations, the learners' understanding and interpretation of the knowledge and/or skills are either unstable or incomplete, particularly in the initial stage of their learning in a new domain, and also in the especially difficult cases (Choi & Hannafin, 1995; Lave & Wenger, 1991).

At this critical point of learning "the right kind of help" (CTGV, 1992, p. 75) from instructors, more capable peers, and parents is both necessary and a must for the learners to carry on their learning and consequently to keep growing.

It has been a common practice in learning that great efforts are made by both learners and instructors when learning or teaching a new subject. At this time, "conceptual scaffolding" could be provided to help learners identify key conceptual knowledge related to a problem or to create structures that reveal the conceptual organization of the subject (Hannafin Land, & Oliver, 1999, p. 132). With conceptual scaffolding, students may find that some tools are recommended for addressing the problem at a particular time, some hints are provided for available resources, and the structure of the learning content may also be provided. The scaffolding, to many, is both important and critical for their persistence in learning. As the students' familiarity with the new subject grows, however, the help is reduced and gradually phased out.

Scaffolding with technology tools

In computer-based instruction, scaffolding is provided in the form of peer discussion, expert advice, multimedia illustration of various tools, and tips necessary for commencing and carrying on a task (Bransford, 2003). Scaffolding is usually provided in the early stages and at difficult points in student learning.

Referring to the SOCRATES curriculum, Honebein (1996) gives us an example of how scaffolding is provided and gradually phased out. Initially, the second year medical students working in the diabetes simulation are wondering (with perhaps a little panic) what to do to start the process of prescribing a remedy. With the supply of a diabetes patient's chart, log book, insulin therapy, and type of diabetes, the students soon take up the roles they are supposed to play. As well, the preceptor initiates group discussion among the students providing them with an expert demonstration, or the preceptor may also provide some advice at critical points. In this example only a part of the scaffolding provided to students uses technology. A considerable part of the scaffolding is provided through traditional means of face-to-face presentations and discussion.

Based on the students' progress in prescribing for simulated patients, the scaffolding is gradually phased out: The groups are disbanded; the expert advice no longer made readily available. The students now have to rely on themselves more and more, eventually becoming independent practitioners. Different cases will be given to the students in various computer-simulations where each student must diagnose and prescribe a course of treatment. In this manner the students will grow and excel in dealing with new cases while referring to past experience. Expert assistance will be provided only when it is very necessary.

Alternative views on situated cognition

Like many other things, people's views of situated cognition are not uniform. While views on situated cognition have been generally positive, the literature contains alternative views on the effectiveness of certain elements of situated cognition.

Anderson, Reder, and Simon (2002) are among those scholars who see situated cognition from a different perspective. In their article on constructivism and situated cognition, Anderson, Reder, and Simon discussed the idea of learning in context that has been advocated in situated cognition. They questioned the necessity and usefulness of locating knowledge to the precise context in which it was used, believing that doing so runs the risk of "…tying knowledge too tightly to specific, narrow contexts." They argued that sometimes knowledge could be taught in a de-contextualized situation. Contrary to the example provided by Carraher (1986) and Carraher, Carraher, and Schlieman (1985) in which Brazilian street children could calculate well in one setting but poorly in another, Anderson, Reder, and Simon (2002) contended that arithmetic procedures taught at school could surely be applied by a shopper and/or a vendor for price comparison or for making change. Similarly, according to Anderson Reder, and Simon, in language arts reading skills were applicable in different contexts. They continued by pointing out that how-to books in various domains provided procedures that could be applied to different contexts, such as carpentry, plumbing or car repair. Instead of rigidly learning knowledge in complex contexts, therefore, Anderson Reder, and Simon advocated a balance between generality and situational context when devising teachable procedures. When it came to the transfer of knowledge, Fernandez and Glenberg (1985), Saufley, Olaka, and Baversco (1985) demonstrated that learning was transferable even if it was not as rigidly taught as in situated cognition.

Authenticity and cognitive apprenticeship, two of the core elements advocated in situated cognition, also generate some different views. A number of authors have stated that learning does not have to be in an authentic environment in which the learner learns from experts only. Rather, it was argued that classroom instruction could also result in student learning, and sometimes it was more efficient and effective (Anderson, Reder, & Simon, 2002; Biederman & Shiffrar, 1987; Fong, Krantz, & Nisbett, 1986). Biederman and Shiffrar (1987) conducted a case study of abstract instruction and apprenticeship learning. They found that with about 20 minutes of abstract instruction a novice reached the level of experts who had had years of practice. Biederman and Shiffrar (1987) believed that abstract instruction was highly effective in some situations. Similar findings were also reported by Fong, Krantz, and Nisbett (1986) in their investigation of the relation between abstract instruction and student learning. Based on the four experiments they conducted, Fong Krantz, and Nisbett concluded that "…abstract instruction was effective on the subjects' statistical reasoning in a wide variety of content domains…" (pp. 253-254). Instead of just focusing on learning by doing, they suggested that a balance between abstract instruction and concrete specific examples might be more effective (Cheng, Holyoak, Nisbett, & Oliver, 1986; Fong, Krantz, & Nisbetl, 1986; Reed & Actor, 1991).

Social aspects of learning as represented by a learning community and collaborative/collective learning is still another point on which views differ. While acknowledging the necessity for one to have social skills for dealing with people and/or work, Anderson, Reder, and Simon (1996; 2002) questioned the necessity to teach all skills in a social context. According to them, learning in a social context was sometimes not as efficient or effective as individual learning. For example, when organizing a meeting, team members might find it difficult to find a time slot that was convenient for all members. As well, people sometimes were frustrated by how some members dominated the team's meeting agenda and some people exploited the system by exercising "free-riding," that is, not doing their own fair share of work (Lea, Rogers, Postems, 2002, p. 56; Nelson, 1999). Collective or collaborative learning, Anderson, Reder, and Simon (1996; 2002) contend, was not a panacea and should be applied where (and when) it could maximize learning.

The effect of a computer-based simulation course: A researcher's point of view

As has been shown there is much exploration of situated cognition is in the literature. Despite the contrary views I think the literature shows that situated cognition may have a great deal to offer in creating more effective technology based learning environments. I have also presented some discussion with reference to Project Decide using a simulation of the principalship for learning. I was interested in finding whether or not there had been any other practical examples of a simulation course. I had been equally interested in learning how computer simulation courses operated and how effective they had been. The information from those endeavours, I believed, would be informative and helpful for the design and actual implementation of the study in question. Through a search of the literature, I found that there had been at least several simulation courses offered at different institutions, mostly institutions of higher learning (Harper, Hedberg, Brown, & Corderoy, 1993; Mappin, 1996; O'Leary, 1994). From the theoretical underpinning that guided the development of the courses, I found that EDPS501: The School Principalship: Seminars and Simulations offered at the Department of Educational Policy Studies, Faculty of Education, University of Alberta was particularly relevant to what I planned to explore. The original course was a simulation of an elementary school (i.e. Pembina School) in the Rutherford school district and there were similar activities, events, situations in that original course. The current EDPS501 was developed on the basis of this original course. Mappin (1996), one of those who developed and taught EDPS501, conducted research on the simulation course and reported his findings in his doctoral dissertation.

According to Mappin (1996), the simulation of Pembina Elementary School has been considered rather successful. In terms of the simulation environment, Mappin finds that most students in the simulation course regarded their vicarious experience as a successful replacement of real work. In spite of some initial unfamiliarity with computer operation, the students thought "the overall design of the computer interface… is intuitively easy to understand and use" (p. 119). The reflective journal was considered "an excellent companion assignment to the seminars in learning from the simulations and integrating that learning with their reading" (p. 172).

Learning in this simulated environment is a process of activating prior knowledge and integrating it with new learning. The students are able to use their accumulated academic knowledge and their experience in their work sessions. The orientation materials in the simulation provide a social and historical context which helps the students understand and solve problems. There is also collaborative work among students who work in groups, albeit in class and face-to-face. In this collaborative work, any peripheral novice students "interacting with the more experienced administrators also enrolled in the course will take from the descriptions of those more experienced administrators the things they think they need to learn and which they view as being valuable to them" (Mappin, 1996, p. 192). In analyzing and interpreting student learning, Mappin (1996) suggested that the students' perspectives were widened through their interactions with peer students and with the simulation. They understood that there existed multiple solutions to a problem and they appreciated the importance of the context in which the problem arose. According to Mappin, the students uniformly agreed that their judgment could be improved through learning. The most important augmentation to student learning in this simulation course, he pointed out, was that students were helped with thinking about their own experiences, thus enabling them to become reflective practitioners.

Mappin (1996) saw room to improve the simulation course. One of the improvements he suggested was more use of video in presenting items and information as this was perceived by the students as more real and closer to what really happened at a school. The areas that interfered with student concentration and absorption were also to be improved so that students would become and remain immersed in the simulation. Thirdly, Mappin thought that the students should be provided with more opportunities for gathering information and investigating alternative courses of action. Finally, he recommended that the students be provided with more knowledge of the consequences of their actions in the simulation. With feedback to their actions in a timely fashion, students would be able to learn the effectiveness of what they would have done and adapt their actions wherever possible in future endeavours. There were some other merits and recommendations in Mappin's dissertation that have not been discussed due to the relevance and/or scope of this research.

Conclusion

I have explored the theory of situated cognition and its potential impact on learning, including computer-based learning. Based on this exploration and the literature review I have identified some elements of learning I think are essential for effective and robust learning with a situated cognition focus. I argue that situated cognition operates in a constructivist framework. Within a framework for situated cognition, student learning may be influenced by enabling meaningful learning in context. Learning in this case is meaningful because it takes place in real-world situations where students, as cognitive apprentices, are exposed to authentic learning activities and have ownership of the problems and issues encountered. By observing and mimicking their mentors and through being instructed and corrected, learners adopt the values and beliefs of the culture in which the learning takes place. Along with their increased participation in and familiarity with the culture of the community of practice, learners may develop from novice learners to experts, moving from simple knowledge acquisition to knowledge creation. As co-participants in the community of practice, learners learn to perform tasks collaboratively, contributing specific skills to the accomplishment of a team project and building and perfecting the community while at the same time benefiting from learning from others.

Chapter Three: Method

Choice of research method

Goetz and LeCompte (1994) pointed out that the primary consideration of choosing a research model depends on "…whether the design allows the researcher to address effectively the research goals and questions posed…" (p. 48). The researcher's choice of research method is guided by a consideration of whether the chosen method is appropriate for answering the research questions. It must also be appropriate for the beliefs/values and orientation of developers and students.

The research reported in this study was conducted within the learning model of situated cognition. The goal was to understand and interpret, through frequent interaction between the students and the researcher, how the students viewed various situated learning experiences and their involvement with those experiences. To achieve this goal, the qualitative approach was chosen because I was endeavouring to understand and interpret whether the course simulations could be seen to have elements of situated cognition and whether or not more situated cognition elements might be incorporated into the course for more effective and robust learning.

The qualitative approach was also considered because the course to be investigated was designed and developed with values and an orientation which stressed individual learning experiences and social and organizational realities (Mappin, 1996). A qualitative approach, therefore, was believed to best support the goals of the proposed research and to relate well the orientation and values of the course to be investigated. It was anticipated that such an approach would possibly open a wider avenue for insightful inquiry.

Qualitative approach

Bogdan and Biklen (1998) define qualitative research as having five features:

1) Naturalistic – In qualitative research, great attention is paid to the settings where the investigation is conducted. Settings such as schools, families, and neighbourhoods are direct data sources and the researcher is the key instrument. Patton (1990) argues that an understanding of naturally occurring phenomenon in their naturally occurring setting is the core of using a qualitative research method. It is believed that the particular physical and social environment has a great bearing on human behaviour (Bogdan & Biklen, 1998).
2) Descriptive data – Words or pictures are the main coded data. Description and narrative are tools that the researcher/observer as a participant uses for understanding and interpretation. Mainly, the description and narrative will appear in the form of text and graphics, including direct quotations. Stake (1978, p. 7) argues for the use of description because "…descriptions are complex, holistic, and involving a myriad of not highly isolated variables." Qualitative researchers attempt to make sense of what is being studied by collecting "…a wealth of detailed information…" that is in general descriptive (Patton, 1990, p. 14).
3) Process rather than product – Researchers are more concerned with the process of meaning negotiation, of reaching consensus rather than final products. Concern with process in qualitative research means that researchers not only focus on outcome, i.e. what it is now, but also, and perhaps more importantly, how the present meaning is negotiated.

4) Inductive – Abstractions are built on an individual analysis of data from numerous particulars, or individual cases. Merriam (1998) observes that qualitative research focuses on discovery, insight, and understanding. It is, as Sherman and Webb (1988) summarize, a "…direct concern with experience as it is 'lived' or 'felt', or 'undergone'…" and also that qualitative research aims to understand experience "…as nearly as possible as its participants feel it or live it…" (p. 7). The discovery, insight, and understanding of the lived or felt experience, according to Bogdan and Biklen, is derived from the inquirer's inductive analysis of descriptive data collected in natural settings.

5) Meaning searching – Different people make sense of their lives from their particular perspectives. Qualitative researchers guard against any presupposition formed in advance and advocate that important categories and dimensions emerge from an analysis of collected data (Patton, 1990). Stake and Trumbull (1982) assert that in qualitative research, "… the well-being of daily practice is the goal.…the practice is guided far more by personal knowings, based on and gleaned from personal experience" and a qualitative study may be designed such that the "…research can evoke vicarious experience…" for the improvement of practice (p. 5).

In addition to these five features, Patton notes that there are other themes of significance in the qualitative method:

Holistic perspective – A phenomenon must be understood as a whole, a complex system for the totality, the unifying nature of particular settings.

Unique case orientation – Each case is special and unique; particularly useful for understanding some special people, particular problem, or unique situation in great depth.

Context sensitivity – Events are understood together with their social, historical, and temporal contexts.

Empathic neutrality – Qualitative researchers take a "…neutral non-judgmental stance toward whatever content may emerge…" (Patton, p. 41) while dealing with their "selective perception, personal biases and theoretical predispositions" (p. 56).

Design flexibility – Qualitative research is open-ended, tolerant of ambiguity and uncertainty. Qualitative researchers "…avoid getting locked into rigid designs that eliminate responsiveness…" and pursue "…new paths of discovery as they emerge…" (p. 41) by adapting to changing processes or situations.

The setting for this research was a contrived setting, a computer lab where the students resolved issues on computers while playing the role of Kelly Goslyn, the principal of Aberhart Junior High School, a school in an associated community which existed only in those computers. Observation and interview were the main data collecting techniques. They focused on what students and instructors thought about the learning activities being undertaken, the merits and weaknesses inherent in the activities, and the learning environment in comparison with conventional instructional environments. The students were encouraged to provide as much detail as they possibly could for the construction of their own stories, and to uncover their experiences of taking the computer-based simulation course. I analyzed the collected data and tried to find patterns, if any, based on the stories and view points provided by the individual students interviewed and observed. At the same time, when I tried to understand the stories from the participants' perspective, I also referred, consciously or unconsciously, to my own experiences, belief systems, values, preferences and/or fears. The result of the proposed investigation, therefore, has been derived through reconciliation, through negotiation and renegotiation of meaning between the researcher as a participant and the rest of the students. Events, or episodes in this computer-based simulation course were interdependent and have been represented as an integrated whole, a complex story. As well, the social, historical, and temporal contexts in which the case was located have been taken into consideration for further understanding and interpretation. Multiple perspectives have been preserved as much as possible as they emerged in the study.

Research design

There are various research designs in qualitative research. Among them, I believed that a case study was most pertinent to the needs of the research. Patton (1985) describes qualitative research as "…an effort to understand situations in their uniqueness as part of a particular context and the interaction there…" (p. 1). Case study, according to Stake (1995, p. xi), is the study of "…the particularity and complexity of a single case, coming to understand its activity within important circumstances." It is "…an integrated system…" (p. 2) that provides "…more valid portrayals, better bases for personal understanding of what is going on, and solid grounds for considering action…" (Stake, 1981, p. 32). Merriam (1998) characterizes case study as "…an intensive, holistic description and analysis of a single instance, phenomenon, or social unit…" (p. 27). "The single most defining characteristic of case study," according to Merriam, is its reliance on "…delimiting the object of study, the case…" (p. 27). A case is intrinsically bounded, that is, the case is "…an instance of some concern, issue…" for the researcher (p. 28). The course studied and the computer-based simulation portion of it, in particular, was the focus of the case study.

A case study was selected because I was interested in how this computer-based simulation course ran, including the students, the activities, and the environment which had been created. A case study, I believed, would help me to understand the students in the situation of taking the computer-based simulation course. I believed that I would be able to "…identify cases rich in information…" through my observation of and interview with individual students throughout the course, which, in turn, served as the proof that "…a great deal can be learned from a few exemplars of the phenomenon in question…" (Patton, 1990, p. 54). By addressing my concern, I attempted and believed to have succeeded in identifying situated cognition elements existing in the computer-based simulation. Consequently, I believed that I was able to discuss what other elements of situated cognition might be used in the computer-based simulation for more effective and robust learning.

Within the research design, I sought to investigate the following four questions:

1. What are the elements in the computer-based simulation, "Simulation of the Junior High School Principalship," that could be interpreted as being part of a situated cognition framework?
2. How might we describe and interpret student learning in this course from the perspective of situated cognition?
3. What could be done pedagogically, or by way of meta-cognitive development, to enhance student learning in this course?
4. Based on the current theoretical framework of learning, what key elements of situated cognition could be added to those that already exist in the computer simulation course design?

Case study

The features of a case study include a focus on particularity, description, and heuristics (Merriam, 1998; Patton, 1990; Patton, 1995; Stake, 1991; Stake, 1995). Particularity means that a case study focuses on a specific object, subject, and/or event. This case study focused on the course EDPS501, on the students who took the course and, particularly, on what they thought and how they responded to the computer-based simulation part of the course, including its delivery format, computer lab learning activities, learning resources, compatibility with reality.

Case study is descriptive (Merriam, 1998). I have endeavored to make the end product of the case study a rich and thick description of what has been studied, a "…portrayal of a situation," as Lincoln and Guba (1985, p. 214) put it. I have attempted to make the description holistic by synthesizing all the information gathered from observation, fieldnotes, and interviews for insight into what was being studied. To reach this, I preserved and presented the stories (sometimes competing ones) in the form of events, quotes, samples, retelling of the students' stories in this final report.

In this case study I sought to encourage discovery and wholistic understanding of and insight into the issues being investigated. The search for heuristics has been addressed through the inductive analysis of the data that identified "multiple realities" based on the students' lived or felt experience (Lincoln & Guba, 1985, p. 40; Sherman & Webb, 1988). Specifically, students' confirming and disconfirming accounts were analyzed for insight and wholistic understanding.

There are different types of case studies (Werner & Schoepfleo, 1987; Ragin & Becker, 1992). For this particular study, I used formal and informal interviews as the major data collecting technique, supplemented by participant observation (Bogdan & Biklen, 1998).

Observation

Participant observation was used for collecting field data. The purpose of participant observation is to develop an insider's view of what is happening. Specifically, the observational data describe the setting, the activities taking place in the setting, students in the activities, and the meanings from the perspective of the observed. In the process, I tried to become "…part of that world while at the same time remain[ing] separate, a part of and apart from…" the observed world (Patton, 1990, p. 199). I have tried to understand this observed world as an insider while describing it for outsiders, with my own interpretation. Merriam (1998) argues that an observation is mainly planned for a certain purpose and is systematically recorded and subjected to checks on validity and reliability. In the observation I acted as a participant observer of the physical setting (environment), the participants (the students), the activities and interactions, and various conversations during both the initial pilot study and main study.

As an observer, I sat quietly in the class and listened to people and observed them. I took notes of whatever I heard and saw. In the computer lab, I sat in the back, usually in the last row, again taking notes of whatever I saw or heard including people's body language. A class lasted about three hours. For the computer lab session, called a work session in the simulations, the students worked on their items and problem solving until they finished or until the end of the class. If they felt like it, they could take a break during the session. A debriefing session consisted of a class with a break half way through. My observations were undertaken in the classes and labs and continued during the break. At this time, I would exchange a few words with some students on things that I heard or saw during the class and was interested in exploring further. For example, I had noticed in the first work session of the simulation that two students, both of them assistant principals at their schools, sat in front of one computer and worked together on the problems. They discussed the things they were working on and wrote their responses collaboratively, while most students sat in their seats and worked independently. I felt curious and sat next to one of the two students during the break in class the following week, asking her about her thoughts on collaborative work and making notes for later study. These notes, and others from my conversations with other students, were taken at the time and subsequently transcribed.

Interviews

The purpose of an interview is to collect a first-person narrative (Helling, 1988). This will most often necessitate the interviewer eliciting information from interviewees. It is, as Merriam (1998, p. 71) stated: "…a conversation with a purpose…" through which a researcher finds out what is "…in and on someone else's mind…" (Patton, 1990, p. 278). According to Patton, there are mainly three kinds of interview: Informal conversational interview, interview guide, and standardized open-ended interview. For this particular study of computer-based simulation in EDPS501, two kinds of interview were conducted – informal conversational interviews and semi-structured interviews.

An informal conversational interview is usually carried out in the period of time when the interviewer carries out observations of the setting. As such, the interview allows the interviewer maximum flexibility to pursue information in whatever direction appears appropriate, as the interview can be conducted repeatedly in different times and situations (Patton, 1990). The informal conversations between me and my interviewees (i.e., all the students registered in EDPS501) in this research mainly took place in the classroom, in the computer lab, or in the cafeteria during the break or before or after a class. Different questions were asked depending on individual students and particular situations. Generally, the questions focused on situated cognition-related issues. The interviews were recorded in writing and transposed later to a word processing document.

Semi-structured interviews were also conducted in my research, with each student being asked the same questions in the same sequence. In the process, however, additional questions that were not in the interview question list were asked to pursue things of concern or ideas warranting further inquiry to develop a more in-depth understanding. Patton (1990) argues that the data from such interviews will be systematic and the necessity for an interviewer's judgment during the interview will be reduced. The interviews for my research were conducted in the middle part of the semester when the students had a relatively firm perception of the course, especially the simulations, and the students and I were familiar with each other. The interviews were performed with all student participants in the EDPS501 course.

A list of interview questions (Appendix A) had been prepared before the semi-structured interview was actually administered. The list consisted of 23 questions derived from the four research questions that focused on the computer-based simulation part of the course. Of the 23 interview questions, interview questions 1 to 12 were intended to address the issues raised in research question 1, interview questions 13 to 19 were to address research question 2, interview questions 20 and 21 were aimed at addressing the issues raised in research question 3, while interview questions 22 and 23 were developed to deal with research question 4.

All semi-structured interviews were tape recorded with the participants permission. Except for a couple of occasions.in which the interviews lasted longer than average, the interviews lasted about one hour and were conducted either in the office of the students in their schools, or on the university campus. The last student was interviewed in the middle of April. The entire interview period ran from mid-March to mid-April. The recorded interviews were later transcribed and the transcript for each interviewee forwarded to that person for their verification.

Study time line

Pilot study

Observation and informal conversational interviews were first undertaken in the winter semester, from January to April, 2000. As the subtitle suggests, this pilot study was to test the water – to find out how the class was conducted and how I as a researcher might best collect data.

My observation started from the third class of the course class in the pilot study, when I was briefly introduced to the class. I then briefly explained that I would attend the class regularly as any student might. I mentioned that I was going to take notes of what I would see and hear in and out of class. As well, I would discuss with them those things that might be of interest to or concern me. My observations were carried out in both regular class sessions and in the work sessions in the computer lab. Informal conversational interviews were conducted mostly in the classroom and the cafeteria during breaks half way through a three hour class. Occasionally, I had informal conversation with the instructors who taught the course, usually after class.

Due to lack of experience, I was not as active in collecting data and pursuing things of interest or concerns in this pilot study as I might have been. As a result, I had only 38 pages of notes, much of them consisting of what I saw and heard with few remarks or reflections.

While the pilot study gave me a good introduction to the course and how to do my research, none of the data collected during the pilot phase has been reported in this study as ethics approval had not been obtained for this work.

Main study

Most of my data were collected during the main study. This was undertaken in the winter semester from January to April, 2002. This study consisted of observation, casual conversational interviews with both student and instructor participants, and formal interviews with student participants. My observation continued to serve as one of main data collecting sources when I conducted my main study. As it had been in the pilot study, I was introduced to the class at the first class. I then explained my research to the class and distributed a consent letter to the students. Since then, I attended the class regularly. As in the pilot study, my observation in this study was carried out in the classroom, computer lab, and cafeteria during debriefing sessions, work sessions, and breaks in a class. Two pilot interviews were conducted in late in February, 2002, when the students were in the second simulated Work Session. The pilot interviews with two students started in late February after the students had completed the second computer simulation because at that time the students had become rather familiar with the computer and the simulation environment. They were thus able to work on problems in the simulation more easily than they had been earlier in the course. The list of the interview questions was modified based on the pilot interviews, and was subsequently used for interviews with the remaining 10 students. I also had a few casual conversations with the two instructors who taught the course. The conversations focused on the student learning and the learning activities taking place in both work sessions and debriefing sessions. The conversations were subsequently transcribed to a word processing document.

Change in my supervisory committee

Initially, Dr. David Mappin and Dr. Michael Szabo served as the co-supervisors in my supervisory committee. Dr. Michael Szabo was forced to leave my supervisory committee in February, 2004 due to illness. Dr. David Mappin has since served as my supervisor. For this reason the term 'supervisors' is used in various places in this report.

Access and ethical considerations

To undertake field work and be out in the students' world, trying to understand what it is like to be one of them, the researcher needs first to gain access to the students and be accepted as one of them. S/he will need to tell the students what s/he intends to do, how it is to be done, and the impact it will have on the students.

An application was submitted to and approved by the ethics committee in the Department of Educational Psychology, Faculty of Education before I started my investigation at the site.

For this study a consent form (Appendix C) was prepared for the prospective participants to sign, acknowledging their agreement to participate in the study. The form explained the purpose, the content, and possible result of the research to be carried out.

The forms were provided to each student in the first day of the class. I explained briefly the purpose of the research to them after the form was distributed to them. The forms were signed and returned to me in the following week in both the pilot study and the main study.

The participants were assured that all data in the study would be kept confidential. Further, the participants were explicitly advised that they had the right to opt out at any stage of the research and that their interests would always receive first consideration under any circumstances.

Finally, all student participants were assured that the interview tapes would be kept in a safe place to which I am the only person who has access. The tapes will be destroyed after the commonly accepted time period of five years.

Participants

There were 12 students registered in the class in which I conducted my pilot study in winter semester, 1999-2000. Except one female, all students were male from various institutions of learning in the province of Alberta. I did not ask the students for their positions at their individual school, neither did I ask them which school or institution of learning they were from.

There were 12 people who participated in my main study. They comprised the entire class of students registered in EDPS501 in the winter semester, 2001-2002 academic year. Among the 12 students, nine were female and three male. There was one student who had been a school principal before being enrolled in a graduate program. There were six students who had been or were vice principals or assistant principals in their respective schools. Ten students had worked or were working at school jurisdictions in greater Edmonton area. Of the remaining two, one was from the Maritimes, and the other from the Northwest Territories.

Data collection

As stated earlier, data were collected in three ways, observation, casual conversational interview, and formal interview. I used the EDPS501 class in the winter semester of 1999-2000 year as my pilot study. I would sit in classroom or computer lab observing how learning was taking place and taking notes of what I heard and saw. I had a few informal conversations with the students and the two instructors who taught the course. Again, I wrote down our conversations.

All data reported in this study were collected from my main study during the winter semester of 2001-2002. I attended the weekly meeting of the EDPS501 course regularly. Before long, the students and I got to know each other and there were increasing opportunities for us to talk to each other both in and outside of class. I observed all learning activities the students were undertaking. I collected data through my formal and informal conversations with both instructors and the student participants, through observing student learning activities, and through my observations of student activities in other occasions outside classroom. Notes were kept during the observation and informal conversation for later analysis. I also wrote personal comments on my feelings and thoughts of what I had witnessed.

In the middle of the semester when the students and I knew each other fairly well and when the students had a relatively firm impression of the course, I conducted the previously described interview with each of the students and had informal conversations with each of the instructors who taught the course to glean their impressions of the course, specifically the effectiveness of the situated cognition elements. These conversations were transcribed and analyzed. The merits and/or weaknesses claimed in their stories were interpreted through the analysis process and through my understandings, which was based on my personal participation in the course.

Data analysis

Data analysis is the process of systematically searching and arranging the accumulated interview transcripts, field notes, and other materials for two purposes: To increase my understanding of the data, and to enable me to present my findings to my readers (Bogdan & Biklen, 1998).

While developing the interview questions, categories for preliminary analysis were identified in light of literature reviews, consultation with my supervisors, my personal values, and my prior experience. Specifically, six categories were identified that dealt with the six elements of situated cognition: contextual learning, authenticity, enculturation, cognitive apprenticeship, scaffolding, and collaboration. Quotations from interviews and conversations concrete examples of student activities from my observation notes were assembled under the relevant codes associated with the categories I had created. These sample texts were selected from participants' responses to the 23 interview questions, from my observations of and casual conversation with the 12 participants as well as my casual conversations with the instructors who taught the computer-based simulation course. There were some responses that were seen to fit more than one category. These were coded and included in all the categories I deemed appropriate.

In order to present a balanced view, in addition to positive examples, some negative examples were included. These examples were largely ones that presented alternative views toward the elements of situated cognition. They were used for problems identification and appropriate revision (Lincoln & Guba, 1985; Ryan & Bernard, 2000; Strauss & Corbin, 1990). Ryan and Bernard (2000) suggest that negative cases may serve to either disconfirm texts of a model or suggest new connections that need be made.

The data analysis included data from the winter 2002 class as well as interviews, and observational and conversational notes from pilot study I conducted in the winter semester of 2000. The data were first read through. The key sentences and phrases were underlined, and proof-read. They were later pulled together into categories. Thereafter, the data was coded, in light of the six elements of situated cognition that were grouped in accordance with the four research questions.

Trustworthiness

Trustworthiness, according to Lincoln and Guba (1985), is to answer the question of "How can an inquirer persuade his or her audiences (including self) that the findings of an inquirer are worth paying attention to, worth taking account of?" (p. 290) to establish trustworthiness, Lincoln and Guba (1985) suggest that we address credibility, transferability and dependability.

Credibility

Five techniques are recommended that help qualitative researchers to produce credible findings and interpretations: Activities increasing the probability that credible findings will be produced; peer briefing; negative case analysis; referential adequacy; and member checking (Liuncoln & Guba, 1985). Those five techniques were applied to my research for the credible findings and interpretations.

By addressing the first technique, I spent a whole semester on the project to first learn the culture of the learning community of EDPS501, gaining acceptance first and then trust of the students. Along with my observation of the class and increasing access to and interchanges with the students, my understanding of the class as a whole and students as individuals deepened and was able to collect in-depth data, detect and take account of possible distortion in the collected data. As well, triangulation was undertaken to ensure that my data were from more than one source and that findings and interpretations out of my data analysis were credible. Dependability section in this chapter discusses how triangulation was undertaken. Peer debriefing was addressed through sharing my findings and interpretations with my supervisor and committee members, the whole process of writing up and modifying this dissertation, including the exchange between my committee and I during my oral examination. Through my analysis of confirming and disconfirming data, I addressed the third technique of negative case analysis. As all interviews were conducted privately and interview tapes and transcripts are kept in a safe place and are ready for data credibility check, the technique of 'referential adequacy' was addressed. Last but not least, technique of 'member checking' was also taken care of, although on a limited basis. Dependability section provides a more detailed explanation as how member checking was addressed and why it was not addressed as well as it could be.

In addition to these five techniques suggested by Lincoln and Guba (1985), Merriam (1998) argues that credibility is to be understood through two integrated parts, internal validity and external validity. Internal validity deals with the relationship between reality and research findings. It seeks to answer whether the research findings capture what is really there (Merriam, 1998), whether a researcher tells the truth (Patton, 2002). Patton (2002) notes that truth does not have an universally accepted criteria and people interpret truth differently. For example, 50 people from areas in business, history, media, popular culture, religion, science, and technology disagreed with each other in their writings on 'what is true?' contributed to the October, 2000 issue of Forbes (Patton, 2002). Patton articulates that answers differ to the question of "Do you, as a qualitative researcher, swear to tell the truth, the whole truth, and nothing but the truth?" from a researcher applying traditional social science criteria, to a constructivist, an artistically inclined researcher, a critical theorist, to a pragmatic evaluator (2002, p. 578).

Reality, or truth, in qualitative research is thus "…a multiple set of mental constructions… made by humans, their constructions are in their minds, and they are, in the main, accessible to the humans who make them…" (Lincoln & Guba, 1985, p. 295). This reality or truth is "something that points more to identifying critical elements and wringing the plausible interpretation from them" (Wolcott, 1994, pp. 336-337). In other words, in order to reach the internal validity, or 'truth value' in Lincoln and Guba's terms, I, as a qualitative researcher, ensured as much as possible that the differing constructions of the multiple students are adequately represented, that is, "…that reconstructions that have been arrived at via the inquiry are credible to the constructors of the original multiple realities…" (p. 296). Specifically, I tried to "describe and explain the world as those in the world experience it" (Merriam, 1998, p. 205).

I believe that the research findings are an accurate reporting of and reasonable interpretation of what the participants thought and did in any particular situation because my interpretations of their view points were derived directly through my persistent observations of and interviews with the participants of the EDPS501 course and the students were given the opportunity to verify the transcripts of all interviews. As a researcher, I was a participant in the learning activities as well. The findings, therefore, were the result of a prolonged engagement in which I spent a long enough time for "…learning the culture, testing for misinformation introduced by distortions either of the self or of the respondents, and building trust…" (Lincoln & Guba, 1985, p. 301). These findings were the result of my interpretation derived from the observation and interviews I conducted for this study, and were also influenced by my personal experience as a participant in the course. Throughout the study, though, I tried to appreciate the complexity of human behaviour in a contextual framework. The potential discrepancy between the participants' actually doing something and my delayed asking them about it was bridged through my field notes, memos, comments, my conversation with the instructors who taught the course and the related comments made by my supervisors and committee members (Merriam, 1998).

Transferability

Transferability is addressed through external validity. External validity concerns the generalizability of the study – whether the findings from one case study could be applied to other situations (Lincoln & Guba, 1985). As has been discussed previously, one of the features of the qualitative research method is its unique case orientation – each case is particularly useful for understanding some special people, particular problem, or unique situation. The aim of qualitative researchers, therefore, is to reach the understanding of that particular problem, unique situation, or special people in great depth, "not to find out what is generally true of the many" (Merriam, 1998, p. 208). Whether or not a study is applicable ('transferable'; Lincoln & Guba's term) in a different setting then depends on the people who will apply the research at another site determining that the site where the results will be applied is enough like the site and situation where the research was conducted to make the new application possible. A researcher doing the original investigation must provide sufficient descriptive data of her/his study for any persons who may wish to apply it to make this determination. The researcher can not know the context in which the transfer is located (the "receiving site") (Mappin, 1996, p. 79), therefore, someone wishing to use the study must determine whether the study is applicable in the new location. It is, Lincoln and Guba assert, a question of transferability that not only involves the original investigator at the "sending site" but also the person seeking to apply it elsewhere. A case study focuses on a particular situation and seeks to derive from the situation that which may be applied to other similar cases. As Ericson (1986, p. 130) argues, case study research may produce something generic "...by studying a specific case in great detail and then comparing it with other cases studied in equally great detail."

Dependability

Although in practice the demonstration of credibility is sufficient to establish the dependability, in principle dependability must be dealt with directly (Lincoln & Guba, 1985). Dependability addresses whether, and to what extent, research findings can be replicated. Put another way, will the same results occur in repeated studies? Lincoln and

Guba (1985) find that replication technique in the sense of traditional approach is problematic for naturalistic research design which, according to them, is "emergent" (p. 317). Replication is not an issue in sort of this case study especially because of a case study's particularity. (See p. 69) the exact class and circumstances could never be replicated.

Lincoln and Guba suggest that dependability could be established three ways. First, they argue that validity (credibility) is the precondition of dependability and point out that the issues of dependability will be addressed as long as credibility is attended to. Next, they propose that an 'overlap method' be used, in which triangulation of data builds credibility that, in turn, addresses dependability. Thirdly, 'stepwise replication' is discussed that may help address dependability. Finally, they advocate the use of an external audit to examine the process and the product of the inquiry.

Triangulation was used in this study to reduce the occurrence of misconception and misunderstanding. To establish triangulation, I collected data from a variety of sources, from casual and formal conversations with both student participants and the instructors, from observations in and outside the classes and labs, and interviews with students and instructor participants. The result was a limited triangulation of the study data. Alternative explanations were sought and incorporated into the data analysis and final report. It was not possible to arrange an independent external audit in the context of the study. However, the supervisors of my study and the members of my doctoral committee provided a limited external audit, with their comments on my work throughout the process of data analysis, writing-up and oral defence of this dissertation. 'Stepwise replication' was not undertaken as it was "very cumbersome" and the procedure might be "dubious" since the "naturalistic design is emergent" (Lincoln & Guba, 1985, p. 317).

To further address dependability, Lincoln and Guba (1985) discuss the introduction of 'inquiry audit' to examine the process by which data were kept. In this study, no inquiry audit was undertaken. However, as recommended by Lincoln and Guba (1985), the six types of data needed for an inquiry audit have been retained and are available should it be necessary to review and confirm my findings. The supervisory committee members, my supervisor in particular, might be seen to have undertaken an inquiry audit of sort when they examined the process of my data collection, and how the data were coded, transcribed, and used in the report. Students who participated in this study were involved in a limited member check. After my interview with the students, each of them received the interview transcript to her/him for her/his verification. This thus ensured the accuracy and authenticity of the data collected from the students. Yet, a full member check was not undertaken as my interpretation of the data and findings were not sent back to the students for verification and approval.

Limitations and delimitations

Throughout this research, I have been zealously promoting situated cognition. I appear to have completely subscribed to situated cognition. While it is justified to clarify my assumptions, world view, and theoretical orientation toward research (Merriam, 1998), it is necessary to remain open-minded as well to attempt to view situated cognition comprehensively and flexibly. I did not realize the seriousness of my personal bias until my candidacy examination, when some questions on the application of situated cognition were asked. Situated cognition in my presentation sounded like a panacea, running the risk of "becoming just another model to be imposed on practitioners out of context and without regarding [to] situational concerns" (Wilson & Myers, 2000, p. 76). I realized that as a researcher, I must commit to an understanding of the world as it is and "to be true to complexities and multiple perspectives as they emerge, and to be balanced in reporting both confirming and disconfirming evidence" (Patton, 1990, p. 55). It is possible that some of my enthusiasm for situated cognition has influenced the results and interpretation of this study. Finally, during the analysis I actively interpreted the data available to me while referring to my personal experience in the course to draw a conclusion.

Another possible limitation is the potential discrepancy between the interviewees' accounts in interviews and what they really thought privately in terms of what was being studied. Out of diplomacy or politeness, interviewees might have only provided positive comments and avoided any negative accounts when they were being interviewed. In this regard, triangulation might have provided more informative data. In addition, I consulted the instructors regarding student learning when the course was completed. The instructors' stories of student learning allowed me to examine the possible discrepancy between merits and weaknesses claimed by the students and any merits or weaknesses that the instructors saw. The boundary between 'course' activities and the 'simulations' which were the center of the situation under study had been a problem for me to identify and respect for the duration of my research project. This difficulty created confusion in my understanding and in the interpretation of the study. It was through repeated consultation with my supervisors that the boundary has, hopefully been clarified. It is my hope that this report is a balanced one which provides both confirming and disconfirming evidence to support or reject the elements of situated cognition. Finally, it must be pointed out that throughout the study this researcher tried to remain open to all suggestions and constructive criticism. These suggestions and constructive criticism have greatly helped the conceptualization and writing of this dissertation.

Chapter Four: Data Analysis

In this chapter, I present descriptions and interpretations of the students' experience with the simulation in an attempt to answer the following research questions:

(1) *What are the elements in the computer simulation, "Simulation of the Junior High School Principalship," that could be interpreted as being part of a situated cognition framework?*

(2) *How might we describe and interpret student learning in this simulation from the perspective of situated cognition?*

(3) *What could be done pedagogically, or by way of meta-cognitive development, to enhance student learning in this simulation?*

(4) *Based on the current theoretical framework of learning, what key elements of situated cognition could be added to those that already exist in the computer-based simulation course design?*

The following sections introduce the class that took the simulation, important contextual elements of their experience, and findings to describe the presence and effect of other elements of situated cognition: authenticity, enculturation, cognitive apprenticeship, collaboration and scaffolding. Subsequently, I discuss how those same elements may be seen to affect meta-cognition and conclude with students' suggestions for improving the simulation.

The class

As has been described earlier, EDPS501 is a graduate education course offered at the Faculty of Education, University of Alberta once a year. The class I attended for my main study was offered in winter semester 2002 with 12 students enrolled. Of these twelve, six had been school assistant principals or vice principals, one had been a school principal, one was a school counselor, and four were teachers. Ten of the students worked in schools within the thirty kilometers of Edmonton. The remaining two were from schools outside the province. All were interviewed and observed in their course work as described in the previous chapter.

After the interviews were transcribed, all 12 students received a copy of their interview transcript for their verification as had been promised in the consent form, to prevent possible misconceptions or misunderstandings. Altogether, eight students responded to my request for verification. For the four who did not respond initially, I sent the transcripts to them a second time and asked them again for their verification. Of these, two emails with the attached transcripts were bounced back and the other two did not respond. I consequently assumed that the transcripts were acceptable as they were.

Research question one: What are the elements in the computer-based simulation course, "Simulation of the Junior High School Principalship," that could be interpreted as being part of a situated cognition framework?

Contextual elements

One of the key elements of situated cognition is that learning is situated in and affected by the context in which the learning takes place. But did the students in this study see any contextual elements in the simulation and, if so, what were the contextual elements in their eyes?

Students acknowledged that there were indeed many items provided in the computer-based simulation that were seen as contextual information. 'Staff Profiles' was one of the simulation items most often mentioned as providing background and contextual information. Other students saw the 'memory flash' feature, the embedded video clips that reminded Kelly of the things which had happened and which s/he should remember, as providing the best background information for resolving related issues. Still others preferred embedded text documents such as policies and regulations. A number of students also thought that the video introduction to the school, school district, and the community was useful for contextual information. In fact, the orientation activities were generally seen as essential by the students for understanding the problem issues presented.

Examples of how students thought about contextual elements were easily found. When asked about his ideas, Copperfield (Interview) mentioned that the 'memory flash,' the "…profile aspect of it…" in particular, represented the history of the issues being dealt with, that is, how the issues in question originated and evolved. The memory flash, he suggested, provided contextual information that was very helpful for his understanding of the issues and, consequently, for resolving them appropriately. In addition to the memory flash, Kathleen (Interview) liked the information linked to pull-down menus which constituted the filing system and file materials for the Aberhart Junior High School: "…the list of students, the list of teachers, evaluations, details about the school…" all provided information that builds the story. Both Cynthia and Shirley found staff profiles most helpful in providing contextual information when they focused on the simulation, although their focus might differ. Cynthia felt her references to the student files helped her a lot in learning about the students, especially the problematic ones. Shirley liked the files because by selecting the relevant pull-down menu, she was able to learn more about the staff, the students, and their parents. In her own words, she was able to "…get some background…" and "…see all the staff members, students, parents." (Shirley, Interview) Rosemary also valued the pull-down menus as a source of contextual information. She was more specific about the content in the pull-down menu that got her started: "… the text materials, either school policy, board policy, either staff profiles that were in text format with their evaluation, student profiles, and all of that…" (Interview). She also appreciated the flash backs ('memory flash' clips): "And now we're getting more video clips on the staff." (Interview)

Besides the staff profiles, the pull-down menu with relevant information and the 'memory flash' video clips, two items the orientation and practice work session, and the short introduction to each simulation were also mentioned as having provided useful contextual information (Belinda, Cynthia, Kitty, Mona, Portland, Shelia, Shirley).

How did the participants describe how contextual elements affected their learning in the simulation? Five items that I believed provided contextual information were incorporated into the interview questions in order to solicit information on how contextual elements affected students' understanding of the events and stories in the work session. Those five items were: (a) the orientation and practice; (b) a short introduction; (c) staff profile; (d) memory flash; and (e) embedded file materials in Aberhart Junior High School.

Eleven out of the twelve students stated that those items helped them with their learning in a positive way. Kathleen (Interview), for example, believed that the background/contextual information provided in the simulation "… builds on the story so that you will have an idea of how to negotiate your way inside the program." Portland (Interview), who had been an assistant principal, pointed out that the contextual information was "…always critical…" for him. Specifically, the background/contextual information meant that he could "…go through the files and check out the historical perspective…" of the school, the events and/or the issues being dealt with. Monica (Interview) appreciated the background/contextual information because "…it helped [with] filling a little bit of the gaps that I wasn't aware of." Belinda was perhaps most enthusiastic about the contextual elements in the simulation; here is what she said about the effect and usefulness of them, the orientation and practice in particular:

> Do I think it's good? Yeah, I think it's really good. It sets the stage, provides you with the climate, the atmosphere, it gives you the mindset. You have to hold that stuff prior to bringing your thoughts to each simulation. (Belinda, Interview)

Rosemary, a teacher and an aspiring principal, felt the items very useful and helpful because with them "…I know what to expect, and I can get all my panic and everything out of my system before I actually settle down to a real work session." The short introduction played before the work session started, she pointed out, was able to provide her hints as to what was to be dealt with that day:

> Sort of foreshadowing, [it] gives you a little bit of a hint what you're going to be dealing with that day. The things like whatever is brought up, I think the first time was by Shirley, and second time was by Stephane. You sort of had a hint what you would be dealing with that day. It's sort of getting into that mode.

Not all students accepted the background/contextual elements without reservation. The background/contextual elements were supposed to provide the participants with information that would help them understand the situation better. On the other hand, the background/contextual elements might also lead people to start seeing things through a lens that might not have reflected the dynamics of the complex or changing reality. Rosemary, for example, cautioned that contextual information such as staff profiles might be a double-edged sword:

> I think it's a little bit about that before, about being sort of a double-edged sword because on one side you want to know as much as you want, then at the other side you don't want to make assumptions based on someone else's knowledge or impressions of people, because everybody gets along differently with different people. And I think it's important that you form some of your own. (Rosemary, Interview)

Although the students thought that the five items of orientation and practice, memory flash, staff profiles, embedded file materials in Aberhard Junior High School, and short introductions provided background/ contextual information, they tended to view the effect and usefulness of the information from their own unique perspectives, based on their background and administrative experience. When asked about the usefulness of the orientation, Cynthia found it very helpful to go through a few situations and use the files to prepare the class for the work session. She was not sure whether "…everyone would be able to get through it…" without the orientation and practice. For Portland, the orientation and practice was quite useful but he felt it was somewhat limited. He "…would like to have a little more information… because there're so many different aspects of a school, you just can't tap into it in a short period of time."

Bush was positive about the contextual information provided in the five items. When asked about the effect of the orientation and practice work session, for example, he pointed out that one merit of the orientation and practice was the examples provided that were "thought-provoking" (Bush, Casual conversation, Interview).

Sheila stated that the background/contextual information provided throughout the items helped her with her understanding of the experience of the characters in the simulation, of how the existing situation came into being, and its current status. She said that the orientation and practice "…helps me understand a little bit about what experience the people in the scenarios are coming from and any type of preliminary experience they've led up to, and what their reactions are going on now…" (Sheila, Interview).

Some students found the orientation and practice "…very helpful…" (Shirley, Interview) and an "…indispensable part…" (Kitty, Interview) of the simulation. Yet the orientation and practice to them was the process of learning how to use the computer, and how to log into the program at the beginning of the first session.

Another item that provided contextual information was the short introduction before each work session. Copperfield thought this introduction set the stage and helped with his mindset. Rosemary asserted that it gave her a hint of what she was going to deal with that day: "The things, like, whatever is brought up, I think the first time was by Shirley and the second time was by Stephane. You sort of had a hint what you'd be dealing with that day. It's sort of getting into that mode." For Kitty, however, the short introduction was "…probably not as necessary…" although she enjoyed having it because it gave her a starting point and prepared her to "…mentally start thinking about that day and time."

When talking about staff profiles, Mona (Interview) believed that effective knowledge about the staff was essential for her because through it "…you could see right away who required or needed mentoring, or possibly supervision, or evaluation in the future." Kitty (Interview) also saw the staff profiles as a valuable source for getting to know her staff: "Obviously, I think that's necessary. It's excellent and it's necessary because how else would I get to know and understand the teachers?" For Bush, the staff profile helped him determine what his staff was like, what their capabilities were. He pointed out that staff profiles were especially valuable since he was coming into a totally strange circumstance - it helped him to know the teachers more completely.

The memory flash was the fourth item providing contextual information. Kitty found it "…extremely helpful…" when the cláss got into the second simulation because the issues or problems piled up when the class entered into second work session, the video clips presented many of those issues or problems in which "…the urgency of each of the sessions had increased and there are so many people, and so many interactions going on that just refresh my memory." Portland found it "…absolutely necessary…" because "…there are so many things you try to remember, you can't remember everything… it strokes back, twigs the memory and you are able to use the information." Copperfield felt that the recollection of characters and/or events in memory flash gave him insights as to the dynamics of the staff. For Shirley, however, what impressed her was the appearance and the style of how the memory flash was presented: "…it's not business-like looking …" and "…it kind of drifts in." When asked about her opinion of the contextual information provided in the simulation, Shelia gave a concrete example from the simulation to show her appreciation of the effectiveness and usefulness of the memory flash:

> I think the little "you remember," or being able to talk to some of the people again, like I said, it gave you some of the preliminary situations that lead up to whatever situations we're dealing with now, and gives you the availability to look into the files, and see if there's

> any other problems that these have been existed. And just kind of allowing you to get a better read of the situation and what decision you might make. There was the one situation with the girl who had sworn at the teacher, but giving her an out-of-school suspension wasn't going to be the answer because at home she didn't have the parental support. She had the parents who were alcoholics, and they wouldn't know how to "make her accountable for being at home" out of school suspension. So I chose to give her an in-school suspension because I thought that would be more of a learning experience. She's going to be more accountable; she has to show up on time. So because I had that background information, because I talked to the counselor, that allowed me to help, or to make better decisions. (Shelia, Interview)

Rosemary thought the embedded file materials in Aberhart Junior High School were useful because by referring to them, she had more confidence in her decision since the decision was based on the relevant policies and/or regulations that made up the embedded materials. Shirley liked the embedded materials very much. However, she said that she would be more comfortable with print copy as she saw it as more accessible. She thought it consumed too much of her time to look for relevant document from the pull-down menu. Some other participants liked the embedded materials but only referred to them initially with "…information given in those files was very standard…" (Bush, Interview). Similarly, Cynthia felt that " …when you get into the second and third session, you just kind of know the policy, so you're not relying upon it as much. … there's nothing new, you're already familiar with it…" (Bush, Interview; Cynthia, Interview).

Summary

In general, the students could identify the background/contextual elements provided in the simulation. The elements appeared in various formats: textual, audio, and video clips. Varying with individuals, five background/contextual items (i.e. the orientation and practice; the short introductions to each work session; staff profiles; memory flash; and embedded file materials in Aberhart Junior High School) were mentioned that were the same as the five items I believed to provide contextual information, although they were addressed slightly differently in some cases. The students were quite positive about the effects the contextual elements had on their learning. Specifically, they believed that the elements were helpful and effective in filling the gap between what they knew and what they didn't and in helping them understand the events, things of concern, and the characters in the simulation, including how they came into being and their current status. It set the stage, provided the climate and the atmosphere, and gave the mindset that a student could "…get all my panics and everything out of my system before I actually settle down to a real work session," as Belinda recollected during the interview, and Rosemary echoed (Belinda, Interview; Rosemary, Interview). Consequently, the students had an idea as to how they could negotiate their way through the issues they were to deal with. At the same time, contextual information might be a two-edged sword in that it may also lead to its audience to seeing things through its lens.

Authenticity: a life-like, vicarious experience

One of the greatest advantages of the simulation is its realism, it is able to represent real life, and, consequently, to provide students with a vicarious experience – a realistic substitute for the experience of seeing and doing things in real life (Mappin, 1996; McGinn & Roth, 1999; Schank & Cleary, 1995). The students observed that the representation of realism was very impressive in the computer-based simulation. When asked to describe their impression of the events and problems displayed in the simulation, the students frequently used such words and expressions as: very realistic; life-like; true to life; very pertinent; right-on; dead-on for things that happen in schools; very closely captures the multifacets of the school principal's day; exactly what was happening in some schools; I see all these situations in my work as an assistant principal; I have dealt with similar problems personally as an assistant principal, or heard of colleagues who dealt with similar problems; and both the amount and kind and severity of the problems are realistic… (Belinda, Interview; Bush, Interview; Copperfield, Interview; Cynthia, Interview; Kathleen, Interview; Kitty, Interview; Mona, Interview; Monica, Interview; Portland, Interview; Rosemary, Interview; Sheila, Interview; Shirley, Interview). Portland felt that the problems represented in the simulation were authentic as those problems possessed the variety of things a school principal might encounter and cope with in real life regularly. Those problems, therefore, were 'normal':

> I would say it very closely captures the multifacets of the requirements of the school principal's day, a school principal's time. When you're in the actual situations in a large school, you could have all these situations happening on a regular basis. They're not abnormal situations. They're very common occurrences. The larger the school, the more frequently you are going to encounter these kind of things. I'd say it's very realistic. (Portland, Interview)

The students, including those who had been school administrators themselves and those who were learning to be effective school administrators, all thought that the simulation successfully represented real-life situations. For the experienced school administrators, the problems were what they experienced themselves in life. For aspiring school administrators, they felt the problems were authentic and true because those were similar to what they heard of from others, including their loved ones, friends, and colleagues. For Shirley, for example, the presentation of the problems appeared close to the occurrences her husband (himself a school principal) shared with her, and which she saw at school herself: "I think they are quite close. I don't think everyday has to be like some of these work sessions, but those I think are typical problems that would happen in a school…" (Shirley, Casual conversation; Interview). What about someone who did not have a principal as a spouse? While Kitty's husband was not a principal and she was a school teacher, she felt that the situations/problems were familiar:

> I think they are very close. And just because I have so many friends and principals that I have gone home and said, "Can you believe there was a woman coming and screaming racial prejudice and she swore at me." And one of my friends would say: "Oh, that happens!" or "Yes this happens!" … I've seen many things happening in the classroom. But I think that they're right, they're dead-on for things that happen in the schools. (Kitty, Interview)

Bush gave several instances in which he had dealt with like problems, such as angry parents, out of control students and student fighting. For some of the issues, he found it especially interesting to have them represented in the simulation:

> There was a particular one, I remember, where a young student, because of his cultural orientation, was really not complying with a lot of female staff. That's a cultural thing and I've seen that happen. It was quite interesting that they were having it in there. (Bush, Interview)

Monica pointed out that she, as the principal in the simulation, walked about the school and talked to staff about their work and expectations daily. Those were some of the things she did routinely as an assistant principal. (Monica, Interview)

Belinda felt much the way Monica did. She mentioned that some of the problems she was dealing with in the simulation were exactly what she had handled in life very recently. For example, the student attendance problem. Within the first three months of the year, she said, she had personally dealt with attendance issues twice already as an assistant principal at her school. (Belinda, Interview)

As these examples show, the participants felt resonance when solving problems in the simulation because many similar problems and/or situations had either been dealt with by themselves, or heard of in their work. Portland pointed out that dealing with those issues "...certainly brought back the memories of my days as an assistant principal..." (Portland, Interview). Consequently, people referred to past (successful) experiences, as Cynthia had done during the work session:

> And I found myself, especially in work session three, using the information, and the experiences that I've had or the conversations with people, to assist me in dealing with the situation that was on the screen. And I think teachers and administrators can't help to do that, that's a natural process for us to take a look back, and remember things we've read, or remember things we've said, or things we've done. And especially if the outcome of those are positive, you use that information then to assist you with the situation you're dealing with now. (Cynthia, Interview)

The students agreed that they benefited from their past experiences. Kitty pointed out that the simulations provided a kind of a vicarious experience that enabled her to draw on her past experience and because of that the problems that were similar to those she had dealt with before "are the ones that are easiest" for her to resolve. Instead of copying their past experiences rigidly, however, they expanded their existing experiences because they knew things changed. For many of them, the past experience served as a platform for one to start with, as was observed by Kitty:

> When I am thinking about solutions or alternatives of the problems, if I've dealt with the problems already, I don't necessarily choose the same solution but it gives me a place to start from. So quite often they're the things that I've seen happened to our school that I find those are easier to attend to than the ones that I've never seen, or never have to deal with. (Kitty, Interview)

While accepting that the problem-solving in the simulation seemed to resemble that in real life and could therefore be a replacement to real-life work experiences, Kathleen mentioned that she felt the simulation did not help her feel much like a principal, not to mention act as a principal. As a school teacher and an aspiring principal, she felt like an outsider, external to the simulation:

> It doesn't help me feel like the principal at Aberhart Junior High. But it does show me how it is unlike I do it. If I had the opportunity, how might I look at it?… But I don't necessarily identify with the principal as I'm supposed to in the simulation… I don't know, I wouldn't say that feel very much like a principal. I'm more like an observer. … But I wouldn't say I know from doing the simulation what it is like to be a principal, I can't say that. But I can say the other things because I didn't really fully feel that I was doing the job of a principal inside the simulation. We are still very much external to it, an outsider. (Kathleen, Interview)

As a teacher who had never been a school administrator, Kathleen could not or chose not to assume the role of the principal possibly because in the computer-based simulation she never experienced the collegial relation that she had in her work, for she felt herself an outsider external to the computer-based simulation.

Some students were somewhat overwhelmed by the number of problematic cases a principal had to deal with in the computer-based simulation, especially those students who had not been an administrator before. Kathleen, for example, found that the amount of information she took in during the work session was

> a little more than you could manage, especially earlier on, when we started out, I think there's too much information to absorb… the other people in the players. … How many you encounter when you're in a work session? I mean there's about 20 or 23, which is quite a lot. (Kathleen, Interview)

Although dealing with similar issues daily as an assistant principal, Cynthia admitted she found that the number of cases to be dealt with in class was intense:

> I would see all those situations eventually, I would never see them all on one day, or in three hours…but what you wouldn't get, is 30 situations in three hours, in a normal work day. (Cynthia, Interview)

For many students, the electronic files used in the computer-based simulation were a significant change from what they were used to at school, where files and documents were still mostly paper-based. To some people, they were not authentic, and thus posed a challenge. For those people, it was time-consuming to find the relevant document from the embedded file materials (pull-down menus). Sometimes, they felt, the right document just refused to display. At this time, one couldn't help missing the familiar hard copy schools still used, as Shirley found:

> I find I almost like the hard copies of those because it's a lot… We had hard copies at school. It's quite factual or whatever. I'd like to have them beside me to apply to a situation. I know that they are there and I mean it's helpful that they are there. But there's almost too much to go through. And by the time I've gone through all that stuff then to find the thing that applies to a problem, I've almost forgot the problem. I'd rather have a printout so maybe I could study it in-between the sessions and get used to it. (Shirley, Interview)

Summary

The students, regardless of their background, uniformly recognized the realism of the simulated problems. They believed that the simulated problems represented the multiple facets of a school principal's day, particularly in severity. The problems, consequently, were seen as life-like and a replacement of life experience. Owing to this realism, many students felt a vicarious experience, a kind of déjà vu, which for them was a great advantage for problem-solving. On the other hand, however, a few students suggested that the intensity of the issues might be a little overwhelming. This was probably the result of the design feature that attempted to address the students' breadth of experience (Maynes, McIntosh, & Mappin, 1992). As well, it might relate to a general preference for reading from printed text rather than from a computer screen. Thus, a printed copy of policies, regulations, and other documents was seen as more close to what they saw and/or experienced at their jobs.

The culture

"Discipline, and legal ramifications, …all the rules of the school…" came to Shirley's mind when school culture was discussed (Shirley, Casual conversation). A school is a small community and has its own culture that consists of beliefs and values.

But can a simulated school like Aberhart Junior High, with all of its problems, have its culture? First, how did students understand school culture? Cynthia interpreted culture this way:

> I think the culture I found was embedded in the teachers' attitudes at first. So as I first went into the program and met the teachers, heard them talk, either directly to me or sort of within earshot, the culture that I accepted was through their comments. So it's very much that obviously their comments are written for them in such a way that we interpret things. (Cynthia, Interview)

Talking to people who work at the same school as oneself is a good way to grow one's appreciation of the culture at the school. It may also be helpful for one to talk to the people outside one's school, especially those who have close relationships with the school such as the district superintendent. That was how Copperfield felt. He argued that he personally benefited from his meeting with the district superintendent, during which he was briefed about Aberhart Junior High:

> The kind of introductory section we had there with the superintendent, whatever, you know, when Kelly Goslyn first met, you get an idea of, a sense of hierarchy. And you know, you meet your support people, and whatever else. So I think that's, that gives you a sense of where you will fit in the picture, regarding organizational culture.
> (Copperfield, Interview)

In addition to meeting people and talking to them, Rosemary thought there were other sources that helped her appreciate the culture:

> At first, you knew nothing about the staff. And now we are starting to get the…[sic], we have the staff profile and we're running into them in the hallways as we walk around the school. (Rosemary, Interview)

Monica agreed that one could appreciate the school culture from various sources, including "the profiles and community, the school act, the district priorities…" because she thought that if one was going to be an effective administrator…then s/he needed to "understand what was happening in the bigger picture" before s/he could apply it to the smaller domain in her/his school. (Monica, Interview)

So the students believed that there was indeed a culture at Aberhart Junior High. For many of them, however, it was a troubled and loose culture. They found that Aberhart Junior High was a school lacking leadership, and was often in chaos (Copperfield, Interview; Kitty, Casual conversation; Monica, Casual conversation, Interview; Shirley, Interview). Rosemary noted, for example, that no staff wanted to be involved in the pancake breakfast at the school (Rosemary, Interview). Kathleen found that the school was laden with problems. She found problems existed "…in the way the school manages discipline problems, the way they treat teachers, the way discrimination is dealt with…" (Kathleen, Interview). Copperfield found himself always on the hot spot:

> The fact that a large part of people are coming to you, you know, it feels like you're sitting on a hot seat, and that in many ways is what a principal is: Butts are always on fire. (Copperfield, Interview)

Shirley was quite frustrated by what she experienced at the school:

> That I found that a little bit frustrating as: How did they organize? What was as special when you first started? Why was the discipline such a mess? Why did they not have more organization for that? Why was everyone acting so disrespectfully, even teachers? (Shirley, Interview)

Having been in touch with people at Aberhart Junior High and after being involved in various issues at the school, most students seemed to have had little difficulty putting themselves in the shoes of Kelly Goslyn. In fact, many people were well into the role. As principals, they felt disappointed and/or frustrated when they saw the disorganizing and sometimes chaotic situations existing in the school. As Kelly they wanted to act. They wanted to change the status quo:

> I wanted, as a principal at that school, I wanted to change some of the things that I saw. And I think that's going to help me to become part of that assimilation, because I wanted them to be different because of the behaviours and the things that were happening in the school. (Monica, Interview)

Similarly, Bush was not happy about what he experienced at the school. He not only saw the necessity for action but already had an idea as to what he was going to do, that is, as the principal:

> Sometimes, you have to say that: "I'm sorry, Stephane, but you're going to have to wait and see me at maybe three fifteen. Can you deal with this now and tell me what you've found out?" Talk to this person, talk to that person, and then deal with a more immediate problem. You have to categorize what's the more important problem. If someone comes to your office bleeding, obviously, you have to deal with that first. It's the priority system. You get other people involved. (Bush, Interview)

As can be seen, the majority of the students assumed the role of Kelly Goslyn and acted accordingly as the principal of Aberhart Junior High. Several, however, found the transition somewhat difficult.

Portland, although an experienced assistant principal, had difficulty "suspending disbelief" (McIntosh, Maynes, & Mappin, 1989) and adopting the role of Kelly. He was able to make the transition but had to be very conscious to make the shift from student to principal. He pointed out that one of the main factors behind the difficulty of assuming the role of the principal was the physical distance between the characters in the simulation and the characters in real life, the lack of face-to-face interactions between himself and the staff in particular. According to Portland, face-to-face interaction with others enables one's ownership of the problem, and builds partnerships between himself and others:

> Actually, I have to be very conscious to make that shift from a student to principal because I find that I still think of Kelly in third-person frequently, and I have to be consciously reminding myself that I'm Kelly. Although I've found it difficult at times simply because the way things are presented to you are different than the way I 'd have presented. Maybe that's why you have to really put yourself into that role of Kelly so that you can say: "Okay, this is the way you are going to do things. This is the way things are going to be done here, got to be different than what sort of you're doing in terms of the way you present things to me, or so on." For me, it's a very conscious activity telling myself that "you are now Kelly." It's not easy. Unless I force myself, I still sort of see it as a problem-solving exercise sometimes… So I just engaged problem-solving techniques without really immersing myself in the role and think, "Okay, this is my school, my responsibility." Personally, not a pure problem-solving exercise. It's possibly because of the lack of face-to-face contact, the fact that I can't wander around and sit down. See, when someone comes to see me, I always try to develop some kind of a relationship first, then get into the problem, and that lack of being able to do that where we go for a coffee and just talk about the issue, when we talk about a few other things before we actually get to the issue. It's that having to quickly get right into the problem-solving role without having any kind of relationship other than with parents or with staff members whatever. I think as a leader,

> I'm to solve a lot of issues through the development [of relationships] or [being] trustworthy, build the trust between the two parties. That is hard to do. It's almost like you have to come to a solution and implement it without having the trust-building relationship. The other part of the courses as a fact, the interactions don't happen frequently enough. You may have one or two sessions where you sit down and work on it over a week, whereas as an actual principal, you're going there every morning, every afternoon, it's constant. That ownership is very easily, … developing an ownership for whatever's happening, there's a lot easier than that, situations like that. (Portland, Interview)

Shirley found a culture, albeit a chaotic one, in the school and felt that she could learn more about it and act accordingly if there had been more interaction between her as the principal and the staff and students:

> Why was the discipline such a mess? …I don't think as a principal at the school I just sit in my office …to learn about the culture, the students, the way it's organized, I think you have to be in the building and see how it's all interacting. (Shirley, Interview)

Like Shirley, Portland recognized the existence of organizational culture but felt the culture was very limited. He thought that the interactions between himself and other people in the simulation were not as frequent as they are in real life. As well, there was the lack of the person-to-person relationship that he experienced in real life. Portland believed it was the gap between what's happening in the simulation and what's happening in real life that prevented him from appreciating the culture more:

> It sort of gives you a superficial understanding of the organizational culture. But I just find that without being immersed completely, you have to base what the culture is on the interactions of your representative. I think if you are in the real-life situation, you have a

> lot more encounters with other staff members whom we don't see on these simulations. (Portland, Interview)

Summary

Most students thought that a culture existed in the school. The culture, according to them, was a troubled one. It was a loose culture characterized by disorganization and a lack of leadership. Consequently, they felt the necessity and the obligation to act, to change the status quo now that most of them were well into their role. The lack of interactions in a real relationship, and a lack of a trust relationship between the principal and the staff and students was seen as limiting the students' recognition of and immersion into the school culture. For some students, such culture was very weak, if it existed at all. Most of those students had to be very conscious to make the transition from student to principal. The students, although they had difficulty making the shift, all felt the same urgency for action. At the same time, though, they were well into the culture of practice of principals given that they were anxious to make decisions as principals. One of the reasons behind the weak culture may lie in the students' lack of ownership. As one student pointed out, ownership derived out of the process of solving problems, from interaction with people and the problems. Due to the inherent feature of simulation, such interaction was not possible.

Cognitive apprenticeship

Cognitive apprenticeship in situated cognition aims to initiate the novice learners/the apprentice into the (expert) practice. This is done through cognitive/mental exchanges between expert and novice learners over problematic and especially difficult problems. The students held different views as to whether they had experienced any kind of cognitive, master-apprentice relationship in the simulation. Some found that there were indeed some teachers or counselors in the simulation who had usually handled the problems appropriately, and were thus considered to be good models to follow, which of course, was not the relationship of cognitive apprenticeship discussed in situated cognition.

Monica saw strengths in a couple of staff members in her school and believed that they could be leaders and shoulder some important responsibilities. She believed that Miles Beaker, a science teacher at Aberhart Junior High, was one of them. Monica found that Beaker was rather capable because he did very well putting a group of students together and facilitating collaboration amongst them. She believed that Robert Rusniak, a physical education and outdoor teacher, was another teacher who could be a good model and share more responsibility:

> And another person there who had a very good manner with kids was the one that once was drinking on the field trip with the kids. But he has a wonderful way with kids about trust, and having them taking responsibility for the things they do. So he would be a very good leader in the group situation as to "What do we want for our school? What does this leader look like?" He was a good model that you would put new teachers coming in with to mentor and things like that. So certainly, there were lots of thing you could do with some of the strengths that were there. (Monica, Interview)

People learn not just from good models and masters. Even some less successful cases of problem handling, according to some students, could still help them think about how to do things differently, even better. Kathleen, for example, thought that the handling of the problems in the simulation was problematic. It nevertheless offered opportunities for participants like herself to ask and try to answer such questions as "How would I do it differently, how can we do this better?" (Kathleen, Interview). She believed some characters in the computer-based simulation, like Frank Kindred, the counselor, served as models of good teachers who dealt with problems appropriately and helped (Kathleen) herself, in a way, to answer the question.

The students' experiences of learning from some capable characters in the computer-based simulation suggested a kind of master-apprentice relationship as opposed to cognitive apprenticeship, since there was a lack of explicit communication of the characters' tacit knowledge or strategies between the students and the characters in the simulation. There was limited or no support, such as scaffolding or coaching, provided in the process according to several students and there was no one in the simulation who empowered the students to carry on independently. Although some students expressed some experience of apprenticeship in the computer-based simulation, almost all of them felt rather frustrated because of the lack of it. That lack may be seen as a lack of interaction between the characters and the students that might help the students think about their own ways of approaching and resolving problems:

> I don't feel there are interactions with the characters, I mean I was looking at them, I was watching them doing a certain thing, then I decided how it could be dealt with. (Kathleen, Interview)

As there was no interaction, the students had no opportunity to consult experienced principals or share their ideas with experienced principals for feedback even when they were uncertain as to whether and how to do something. For some students, this was rather frustrating:

> The interaction with, especially the ones that were very problematic, became a little bit frustrating because you would do certain things, and

> then you kind of go back to the experienced principals' feedback. Are the things that I did, were they effective? You really don't know that because then this person comes up again with the same thing. So then you're to assume that it wasn't effective and you try to think of some other things to, some other ways to solve the problem, or some other ways to help that person become a better teacher, or a better colleague, or whatever. So I found that to be a little bit frustrating… Every time you would do that, you didn't really get the feedback you needed to know whether what you were doing was appropriate. So then you couldn't really judge whether you had learned a good way to approach or not, because you didn't get that feedback. Just negative feedback from the person because you consistently were dealing with this person on issues. There was never one time when you saw him doing something positive, but he was geared to helping the people in the school with the students in his class. So you never really got the true picture of whether what you were doing was working. (Monica, Interview)

Kitty had a similar experience to Monica in the computer-based simulation in terms of cognitive apprenticeship learning. She felt that she was rather passive: "See, I truly don't believe there's interaction. I think I'm witnessing their side of story. It's like I've read their little information they want to share with me."

Because of the lack of interaction, students didn't know the result of the decisions they had made, especially with the problematic ones. Consequently, students were cautious about making a new decision, as Belinda found:

> You know what is difficult is that you never find out the results. And I find that very, very difficult to make decisions, I make decisions based on decisions, and it's difficult there because they want the whole scenario of what you're going to do…. And I find it very narrow, and very limited. I find that very difficult. I'm not sure. I'm

> not sure what I'm learning in terms of the decisions I've made after I left that computer session. (Belinda, Interview)

Cognitive apprenticeship outside the simulation

For most students, lack of cognitive apprenticeship in the simulation did not mean that they had no such experience. In fact, they all appeared to have experienced cognitive apprenticeship in the activities that were outside the computer-based simulation but still inside the course. They believed that there were indeed opportunities for cognitive apprenticeship learning in the debriefing session, which was also an integrated part of the course. During the debriefing, they pointed out, there were many more opportunities for an exchange on problematic cases, points of interest between the students, and between the students and the instructors, who had been administrators themselves:

> …it's the debriefing in the discussion and class, asking the professors 'what would you do' and I write down what they say because I don't have a store of knowledge about that. So, it's the discussions and debriefing afterwards about those problems I think those problems are very real. And that's the benefit of it, it's the discussion with other experienced people, that professor just says "Okay, that's a good approach." I think the computer simulation presents the problems really well. Because it really has to, you can't avoid, can't turn the pages and say, oh, I'll deal with it later. It really makes you feel like you're right there where the problems are happening. So you're really, you really mean when you ask your classmates: "What did you do? What did you do for the first solution? How did you handle that?" You really remember it and, and you write it down. (Shirley, Interview)

Belinda found that the discussion in the debriefing session helped her clarify things and learn: "Sometimes when we discussed in class, there's some clarity. Yeah, when we go and sit down and discuss things, then they come along and … you know, like the one session where we did the discussion, that's better for me." (Belinda, Interview)

Summary

There was a lack of cognitive apprenticeship learning in the computer-based simulation part of the course, although a couple of the students thought that they benefited from the examples of some good characters in the computer-based simulation. Outside the computer-based simulation but still inside the course, however, most students found that sharing amongst themselves during the debriefing session had in many aspects the function of cognitive apprenticeship. For example, the students' experience in consulting instructors and more experienced peers and being consulted on problematic and especially difficult cases. This, according to the designers of the program, was consistent with their aims. Cognitive apprenticeship strategies, as they pointed out, were not considered when the Aberhart Junior High School simulation was designed.

Collaboration

In situated cognition, collaboration or collaborative learning is a learning process, a co-ordinated and synchronous activity meant to construct and maintain a shared conception of a problem (Littleton & Hakkinen, 1999; Roschelle & Teasley, 1995). Group or team work is seen as a practice of collaborative learning and can be planned or ad hoc.

During the simulation's work session the students would log into the program individually and work on their own. They might pick any problem to begin with but had to cover a given number of problems in two and half hours. There was no requirement for group work. In fact, 'exercise of responsibility' requiring individual work was a design feature. In almost all cases, as soon as the session began they would log into the program and busy themselves with problem solving or with investigating the background of the problems. They might read a memo, watch a video clip from memory flash, listen to telephone calls, or refer to a document in the embedded materials, all of which were related to what they were dealing with. As such, no collaboration was seen during the work session. Many students felt that they were usually on their own and they were on different undertakings (Copperfield, Interview; Kathleen, Interview; Monica, Interview; Rosemary, Interview).

The reason for a lack of collaboration in the computer-based simulation varied with the students. For Shirley, it was the density of the problems that prevented her from collaborating with others. There were so many to be resolved and so much to refer to for problem-solving that she felt the urgency constantly –she had barely solved one problem and the next problem was already there waiting for solution. Consequently, she could not afford to spare her precious time talking to peers:

> No, we do not collaborate with anyone. We're just doing it by ourselves individually in the lab. There doesn't seem to be time for it. You can't go and help someone. You can't stop and discuss anything because the next problem is coming in. You had to fit it in… But during that simulation, you're just isolated on your own…
> (Shirley, Interview)

On the other hand, Shirley thought that this lack of collaboration might be a good thing for them; it was close to reality and therefore good practice for independent problem-solving abilities:

> …perhaps that's really what the job's like. So maybe it's good training. In real life, in a perfect world, you might have a great assistant

> principal to talk things over. You might have shared leadership. But I think there're many times when you're alone solving those problems. So it's a good experience that way. (Shirley, Interview)

Collaboration does not necessarily mean that people do things physically together. It means interaction between one another with a joint commitment to a shared task. It can be in various formats like a discussion, or else dialoguing on points of interest and/or things of concern. But Kitty found neither in the computer-based simulation, which made her feel like an outsider:

> There's no dialogue, like you will have in a school. I think the fact they give you the clips of people you can talk to, I'm always watching. I am from the outside watching what they're doing. So my answer to that is 'no', I don't see that I am collaborative, I'm an outsider watching to see what's going on next. But I am not collaborating with anybody in the simulation. (Kitty, Interview)

As an assistant principal, Cynthia found the lack of collaboration different from what she experienced where she was employed:

> [In my work here at school,] we collaborate with people all the time, all the time. Yeah, we are very much a team, especially in the office. So when I make a disciplinary decision, or a decision about curriculum, or student schedules, I'm always looking at not only who the teachers will be and talking with them but ensuring that it's meeting the parental request or it's meeting whoever's in charge of it. But very much it's a collaborative process, always when I come to the students. So that's one thing I did find very different about the program. (Cynthia, Interview)

Portland didn't see collaboration during the work session, either. He believed that there were mainly two reasons that made any collaboration during the work session very difficult, if not impossible:

> I guess it's because of a couple of reasons why that hasn't encouraged collaboration. One is you're wearing earphones, everybody's wearing earphones. So it's not easy to collaborate. Second is the time restraints, I'm kind of deadline-driven, so if I have two hours I'm going to want to cover everything in two hours. So I'm so focusing on getting the task done and task-focused, I don't really see the time to collaborate. (Portland, Interview)

Besides the earphones and time restraints, Belinda believed that collaboration was also made impossible by the fact that everybody was on different problems, and everyone prioritized (their sequence of solving problems) differently. On the other hand, collaboration did take place during debriefing session, which was an integrated part of the computer-based simulation course. This collaboration is to be discussed later in this chapter.

Summary

Collaboration is one of the key elements in situated cognition. Few students, experienced collaboration in the computer-based simulation because they simply could not - the characters in the video clips did not respond to whatever decision/action the participants took. Also, the students could not collaborate with one another while working in the lab because of some restraints. They wore earphones to listen to the episodes in the simulation and these prevented them from listening and talking to each other. Also, the density of the problems forced them to focus on dealing with one problem after another, rather than dwelling on one single problem. Finally, individual prioritization of the problems allowed the students to resolve those that they thought most important or felt most comfortable with, which meant that they were on different problems. Lack of collaboration, consequently, made many participants feel like outsiders and therefore isolated. At the same time, though, working independently on problem-solving was one of the design features of the computer-based simulation. The students were not instructed or encouraged to work collaboratively during the work session for the purpose of 'breadth of experience' and 'the exercise of responsibility' (Maynes, McIntosh, & Mappin, 1992).

Scaffolding

Scaffolding is the 'right kind of help' from experts or more capable peers that supports the learners' learning (CTGV, 1992). Scaffolding is most helpful for novice learners, especially when they are in the initial stage of their learning in a new domain and when they encounter some especially difficult case in their learning (Choi & Hannafin, 1995; Lave & Wenger, 1991).

Scaffolding in this case is interpreted as tailored help by various means to support students' learning efforts at the point(s) where they encounter some especially difficult problems and cannot solve them alone. Such help was very limited, if provided at all, from within the simulation as some students found. When asked about the help provided in the computer-based simulation, for example, Portland found it very "…limited, I would say, if I understand properly…" (Portland, Interview). He mentioned that some relevant pointers and video clips provided in certain cases helped him arrive at a solution.

For most students, however, such help was not available at all from within the computer-based simulation. Sheila (Interview) couldn't describe any scaffolding help from the simulation: "No, no. No help was offered in the simulation itself. I mean once it (computer) was frozen, once it was jammed, that was it. There was nothing except me putting my hand up and calling an instructor over." Monica for example, felt quite on her own in her problem solving:

> No, no. Not in that sense. Like I didn't find that there was someone that I could talk to. I didn't get a sense of that. It was like you were out there on your own, you solved these problems… I always felt that I was rather out there… But there was never once that people came to me with a solution, which I would as a principal, ask them: "Okay, you've got these complaints, how could you solve it? What kind of solutions you can come up with?" But you couldn't have that kind of conversation in the simulation, and that I have a lot of things that I could or would have said, but wasn't able to do that because you didn't have that two-way communication.
> (Monica, Interview)

Summary

The students, as can be seen, did not feel that much help that might be termed scaffolding was provided in the computer-based simulation. On the other hand, their expressions reveal that they wanted such tailored help during their study, particularly when they encountered some especially difficult problems that were too difficult for them to resolve alone.

Research question One: Summary

Contextual information was provided in the computer-based simulation and appreciated by the students as they were able to identify elements in the computer-based simulation that provided contextual information, although they differed in identifying specific items of contextual information. The students uniformly recognized the realism of simulated problems in the computer-based simulation and felt it a genuine replication of real life problem with the same challenges. The students were not satisfied with their understanding of and involvement in the culture at Aberhart Junior High School. Yet, some enculturation took place when they put themselves in the shoes of Kelly Goslyn and resolved the problems encountered. As well, a form of enculturation took place when they helped others or were helped by others to resolve various issues during the debriefing seminars. In the capacity of principal, they were, in effect, active members of the community of practice of school principals, if not of the community of practice of Aberhart Junior High School. Cognitive apprenticeship inside the simulation was not reported by the students. The students did not feel the existence of collaboration or scaffolding, either. This lack of cognitive apprenticeship, collaboration, and scaffolding in the simulation had much to do with the theoretical learning model that guided the design and development of the course. With the focus on experiential learning, the designers of the course intended the issues of breadth of experience and the exercise of responsibility to be addressed (Maynes, McIntosh, & Mappin, 1992). Situated cognition was not the pre-eminent influence in the design of the course.

Research question two: How might we describe and interpret student learning in this simulation from the perspective of situated cognition?

Contextual elements and their impact on understanding and decision-making

As has been discussed, all 12 students found background and contextual elements in the simulation. They almost uniformly felt that the elements had a very favourable impact on their learning.

Copperfield thought that the contextual information was crucial for his understanding of the people at school because it provided a "…much more important perspective on attacking issues…" (Copperfield, Interview). When dealing with individual staff, he pointed out, he would deal with staff differently because his understanding of each individual staff member had been improved by the background information provided. For example, he would be much more at ease when Miles Beaker brought a problem to him because he knew, from the staff profile that "Beaker was a capable teacher and had usually done the problem by 90% before it was brought up," whereas he had to do "damage control" when "an idiot like Archie" brought a problem to him because "…he's blown it out of proportion, and he's probably shot himself in the foot…" (Copperfield Interview).

Monica believed that the contextual information helped her "…understand the people who were in Aberhart, and it also helped me deal with them in the most appropriate way." Like Copperfield, she also felt the necessity to deal with individual people differently based on their individual backgrounds:

> There were some people who you, after kind of having that background contextual information, that you knew that you can deal very directly with, and there were some people who you had to be a little bit gentler with, to guide them and direct them in an appropriate way. So that was certainly very helpful in that way. (Monica, Interview)

For some students, contextual elements provided "special flavour" to each scenario, enabled them to find the previous event with the same kind of "emotional exchange," and they were "…another example of the experience…" (Kathleen, Interview). Mona believed that the contextual elements enabled her to look deep into the issues and were critical for her decision making. She pointed out that the information "brings to attention that you can't look at the things on the surface… so that you can make the informed decision." (Mona, Interview)

Some students had concrete examples of how the background/contextual elements helped their learning. Belinda, for example, talked about the native girl's swearing problem at Aberhart Junior High and how she was able to trace the source of the problem. Consequently, she was able to make a more effective decision:

> We're going through all the 'You Remember' and the stuff again. I think I can probably tell you that looking at that native girl and her problem with her mother is swearing… And if you noted on the document, you read through the document the violent mother had written: "She's allowed to swear if she feels she wants to." So, right away you know that you've got a mother that is not on your side. And you've got to win her over. So, those kinds of things helped me to understand the story. If you took time to read all that information, there're lots there. It's very helpful. (Belinda, Interview)

Rosemary thought the details in the contextual information helped her get an inside view of the issues being dealt with. She recollected how her attention to the details provided in the contextual information helped her see the issue behind a teacher's complaining about thermostats at Aberhart Junior High:

> Yeah, that's what those details do. I mean they show the complexity that we can find in a problem, something we hadn't thought of before. For example, when the teacher came, when she was annoyed by the thermostats, first I interpreted this exactly as a very flat problem… I think there's actually a deeper issue here, which has nothing to do with the thermostat, but has to do with how this teacher's feeling in her relationship with the administrator, and how the teacher's feeling

as a teacher in the school.

Still another merit of providing background/contextual information, according to Shelia, was that it was able to provide her with past experiences in a safe environment so she didn't have to "…learn by a kind of trial by fire…" (Shelia, Interview).

Summary

Students were very positive about the background/contextual elements in the simulation. They pointed out that the background/contextual elements were crucial for a deeper understanding of the staff, issues, situations, and/or any issues of concern. Because of this understanding, they were able to make appropriate and often more effective decisions, either delegating or dealing with problems themselves. The students were thus learning to be effective principals.

Authenticity and learning

Not surprisingly, it was popularly acknowledged that the problems in the computer-based simulation were very realistic and true to life. Many students found it to be a very real experience to deal with various issues in the computer-based simulation (Belinda, Casual conversation, Interview; Bush, Casual conversation, Interview; Copperfield, Interview; Cynthia, Interview; Mona, Interview; Monica, Casual conversation, Interview; Portland, Casual conversation, Interview; Shelia, Interview). This allowed them to connect their actions in the simulation to their previous experience. Copperfield, for example, pointed out that he made a lot of decisions on the basis of what he had done before at work (Copperfield, Interview). Bush had a similar experience. He pointed out that because of his past experience of solving problems as an assistant principal, many a times a solution to the problems popped up instinctively to him, as somewhere, sometimes, he handled similar problems before:

> …because in many cases I'd say this is the way I handle it. Right away. Instinctively it comes up here and say, this is the way I deal with this woman, this is the way I deal with this parent. This is the way I deal with the student…. But right away you are thinking this is what I'm going to do. It's already coming. (Bush, Interview)

When asked whether he meant that he would use exactly the same solution that he had used before to solve the problems he was facing now, Bush explained that he did not and could not apply exactly the same solution to the new problems because the audience, the surroundings, the cause of the problems might all be different. Besides, not all solutions in the past were successful. Then how to explain that his solution occurred to him instinctively? What was meant by saying that ideas come to him instinctively, according to Bush, was that he would immediately think of the mechanism of resolving the problem; accessing background information, finding appropriate staff, calculating options, or other things.

Facing life-like problems, Cynthia found that sometimes administrators couldn't help referring to past experiences, especially positive ones:

> And I found myself, especially in work session three, using the information and the experiences that I've had or the conversations with people to assist me in dealing with the situation that was on the screen. And I think teachers and administrators can't help to do that, that's a natural process for us to take a look back, and remember things we've read, or remember things we've said, or things we've done. And especially if the outcome of those are positive, you use that information then to assist you with the situation you're dealing

> with now. (Cynthia, Interview)

The resemblance of real life problems to problems in the computer-based simulation also enabled Portland to draw from what he had experienced before and consequently, to keep vigilant where his past experience told him to do so:

> I certainly did even as late as last session, where you had the situation where you had the students obviously on some kind of drugs. I've had those sort of things happen to me. I recalled the situation where I walked down the hall way and encountered a student acting strangely. You knew something's not right. You had to be little careful about how you would handle all those sort of situations. There would be a serious, negative backlash if you made wrong accusation. Those sort of things are happening in real life situations. …so, it certainly brought back the memories of my days as an assistant principal. (Portland, Interview)

Monica was more explicit in terms of utilizing problem-solving opportunities for becoming a better, more effective principal. For Monica, her sense of déjà vu in the simulation meant more than her dealing with a similar problem with the same solution. In other words, it was not enough simply to copy the past experience and reapply it to a similar problem. Drawing on her experience also meant that she tried to consider alternative decisions, opportunities to better the past solutions:

> …because we are human beings, we learn from our mistakes. Sometimes some of the things I may not have dealt with exactly the way that I wanted to. When I reflect or write down my day, I think, "Okay, I would have done that differently. This gives me an opportunity to actually do it differently." That was a very positive thing for my learning because I got an opportunity to practice something without really having an effect on the lives of the people that I will make a decision for. (Monica, Interview)

For any student who had never been an administrator, solving life-like problems in the simulation was an eye-opening experience and a rehearsal of what principals truly had to deal with (Kitty, Interview; Rosemary, Interview; Shirley, Interview). Others who were actually assistant principals in real life saw it as a beneficial experience that gave them more confidence in handling similar problems in the future:

> I think it's beneficial that we experience them in the simulation before we actually experience them in the real life. Just being involved in that scenario and having that experience allowed me to, in the real world, feel more confident about making those decisions, and feel more comfortable, and gave me some different channels as to which ways I can go, and different steps, so that I thought it was very positive. …I think that you feel more comfortable about making that decision because you've already experienced it in the simulation. It might be different taking on the scenario because it might be slightly different. But I think you're more comfortable and confident to make that decision and the learning is there with regards to it's familiar now, it's not foreign to me. (Mona, Interview)

Realism was not necessarily embraced by all students without reservation all the time. For a person who had not been exposed to a similar situation, the volume and complexity of the life-like problems sometimes appeared so much that s/he felt them to be insurmountable. Kathleen, for example, experienced such a feeling when she first encountered the problems. As a novice who was learning to become a school administrator, she found herself at a loss as to how to prioritize the problems and approach them accordingly:

> One of the things I found was that when there were so many of these scenarios, I didn't have any idea, for example, of really whether I should solve the problems in 24 hours or 72 hours… or even how

> much of the crisis it was where you're supposed to decide whether it was a minor or major kind of a problem. And really, I didn't find, after doing a few, that I had any sense at all really to what to select in that case. Sometimes I was able to decide that, but most of the cases I really didn't know. (Kathleen, Interview)

Summary

For those students who had been administrators, the life-like simulation problems embodied the same magnitude and same challenge as they encountered at school daily. An experience of déjà vu might be ignited within students tackling those life-like problems, a feeling that somewhere and sometime before, they had dealt with similar problems. Consequently, they were able to draw on their past experiences, either successful or unsuccessful. The key in their experience, according to some students, was the mechanism for problem solving, that is, how to approach a problem, how to find alternatives. Owing to the breadth of experience offered and the exercise of responsibility undertaken, the life-like problems in the simulations provided opportunities for the students to practice their problem-solving skills, enabling them to be well on the way to becoming better, more effective principals. For the novice learners who had never been school administrators before, they felt the life-like problems prepared them for their future endeavour; a rehearsal of what might happen when they assume a principalship in the future. They, too, were learning to become good principals. Due to their lack of experience, however, novice and some experienced school administrators felt occasionally overwhelmed by the intensity and complexity of the life-like problems presented. To the novice, the intense and complex problems appeared sometimes insurmountable.

Enculturation: Leadership, responsibility, and shared values

Copperfield saw the Aberhart Junior High School's organizational culture as one in which people handled their own problems. In this culture people passed problems on and leadership was vested amongst the staff. As a principal, Copperfield found the school culture at Aberhart Junior High as loose, with little, if any, shared value and leadership. Other students held a similar view toward the culture at Aberhart Junior High. From their position as a principal, they saw the organizational culture at the school as a "troubled culture," the fabric of which was very much "in need of repairs" (Monica, Interview; Kathleen, Interview).

For Bush, the school was rather disorganized because there were too many issues brought to him daily: "There are some staff issues, some student issues. There are some administrative issues, also there are some support staff issues, with Frank coming back right now. She's got some issues, too." As a result, he saw the necessity of and opportunity for building strong leadership through empowering people, and surrounding himself with capable people:

> However, something that you have to slowly build, is your vision of organizational culture, too. They say that the importance of the quality of a good leadership is not only empowering others but surrounding yourself with very capable people. That's so important. If they're not capable, that means you make them capable. How do you do that? Well, it's a slow and meticulous process. (Bush, Interview)

Bush elaborated that to reach his goal of building up the culture, he would impart his "…particular leadership prowess…" or his "…particular visions of leadership, or idea of leadership, into Kelly Goslyn."

Putting herself in the shoes of Kelly Goslyn, Rosemary found the issue was how to delegate. As principal, she had already found out who could be relied upon and who could not:

> I think some of the things you've seen have influenced the way you made your decisions because you've seen Stephane not being very effective. So you knew you shouldn't delegate this big problem to him because it's not going to be solved. So, by knowing how things were working at your school right now, and the culture, you knew a little bit about who you could and couldn't maybe rely on now to help you with decision making. (Rosemary, Interview)

For Monica, she thought it necessary to take the initiative at Aberhart Junior High. She argued that as a principal she must be a "…problem solver, or a facilitator, or an information giver…" (Monica, Interview).

Mona was more specific as to how she was going to pursue the organizational culture. She thought that she would actively build it up by setting "…some plans and actions that would allow for collaboration, allow for shared vision…" (Mona, Interview).

Summary

Culture here refers to the dominant practices and the shared values in an organization. Enculturation means to be immersed in the culture, to do and speak as most people in the community do. Enculturation was not the case for some students since they did not feel that a culture existed in the school, that is, there were no shared values. Other students found it would adversely affect the school's operation if they were simply to immerse themselves in the culture of Aberhart Junior High, which they saw as a loose, sometimes chaotic place. As such, they saw the necessity and opportunity for contributing to the building of a positive culture in the school community. As principal, they were going to take the initiative, they were going to build a strong leadership and a functioning culture. Enculturation for them, therefore, was not something to passively accept. Rather, they saw enculturation as involving parallel actions, actions which would take place between an individual and the community with an individual influencing the culture. If there was a culture at Aberhart Junior High, therefore, it did not have much influence on the students' learning to become effective principals since they were passively doing things in this sometimes chaotic place. The students felt that they could be, and should be, proactive, that they should actively contribute to the formation of a new and functioning culture within which the staff could function appropriately and effectively. That was the culture that the students wanted to create and be part of. As well, it was a culture they would want others to live in and accept. If they could do it the students thought they would benefit greatly in their learning to become effective principals. Enculturation was realized when the participants were thinking, dealing with issues, and suggesting changes, for in these instances they were acting as school principals already. The 'culture' of practice in which the students were immersed was the culture of the class, the dominant practices and shared values were evident during the debriefing sessions.

Cognitive apprenticeship: Missing

When a novice learner follows her/his master not only physically, but, also cognitively, in solving a problem, there is cognitive apprenticeship. In this relationship there is much communication or interaction between the two regarding what's being resolved, how to resolve it, and/or why they should do it in the given way. As Kathleen (Interview) found: "It's interesting to know how other people might have solved it (the especially difficult problem) and maybe just discuss it." She asserted that peers, particularly those with the experience, had "a lot wisdom" that would make her work "really more effective than working through on my own."

Portland used to consult his experienced colleagues on problematic issues when he worked as an assistant principal. He recalled that he would talk with his colleagues before making important decisions. Most of the time, he said, he benefited from such practice because other people might have experienced the thing being dealt with while himself might have just encountered it for the first time. Therefore,

> A lot of decisions I would be sitting down and having a discussion with Stephane or the counselors, where I would actually sit down and say: "What do you think of this thing?" Ideally, in the simulated session I would be provided with that opportunity as well. (Portland, Interview)

Belinda saw cognitive apprenticeship as a kind of communication with someone with experience that might help to clarify many of the things that had been problematic for her. Such help was not a straightforward solution to the problem. Rather, it was a kind of tip that might lead to the solution to the problem. She herself benefited from such expert help in the course:

> The other day, when you guys had all left, then I balked a minute and I said to one of the instructors: "Okay, tell me about this. Come on, tell me as a principal." Because we had a lot of discussion about a lot of things and I don't know we ever, ever knew which was the right way." So then I got him into the corner and he said: "Oh, yeah, I see the value, blah, blah, blah…" Then I felt like I was really talking to an administrator because that's what you do when you network with administrators, you phone somebody else: "Oh, this is what happened.

> What would you do?" And they don't tell you exactly. But they give you tips from their experiences, and from their and your own experiences you can really make pretty good decisions. (Belinda, Interview)

Communication does not necessarily mean to only talking to someone directly. It also means to listen to and/or read related solutions to similar problems, as Shirley experienced in the simulation. By reading and/or listening to the stories of the characters in the simulation, Shirley believed that she could learn from how the characters handled things, even from the mistakes they made:

> Sometimes, you see, people that I believe have some potential leadership qualities will be on the tape telling me their take on the problem, like counselor Frank, Frank Kindred, and the female counselor. You know, some people that I think have few leadership qualities, they'll say: "Oh, this is what I thought." And so that helps me with some of the things, "Okay, if they think that, yeah, that's a good way to go, or… We can always learn from others. You can spin, Okay, that was a good one, I would have been done it that way, but I would have suspended them for one day, not three days. So you can sometimes learn from the mistakes of others, you can learn from the ideas when others offer them in the simulation. (Shirley, Interview)

To most students, however, there was no communication or interaction at all between them and the characters in the simulation. Instead, they might communicate with other people in class on problematic things. In Belinda's case, as is shown, she consulted one of the instructors who taught the course, not a character in the simulation. Because of design limitations there was no opportunity in the simulation for cognitive apprenticeship, and the students did not feel that the way the characters could be used was helpful in providing cognitive apprenticeship. When asked about how the interactions between her and the characters in the simulation affected her learning, Kathleen did not find any effect from these characters since there was no interaction at all between them:

> I don't feel there are interactions with the characters. I mean I was looking at them. I was watching them doing a certain thing, then I decided how it could be dealt with… No, I would not describe it as an interaction with the characters at all. I mean those aren't like characters, like a box, it's flat. The story is there, and then you interpret it. You can interpret it, you can ask them questions. You can say: "Well, why is he doing that?" or "Has he done it properly?" And then you can say "Well, if he's not doing it properly, how would I deal with it?" … I wouldn't say the characters are affecting learning. (Kathleen, Interview)

Mona did see interaction in the simulation, but to her it was frustrating because the interaction went in one direction only:

> The interaction with, especially the ones that were very problematic, became a little bit frustrating because you would do certain things, and then you kind of go back to simulation for feedback. Are the things that I did, were they effective? You really don't know that because then this person comes up again with the same thing. Every time you would do that, you didn't really get the feedback you needed to know whether what you were doing was appropriate… So you never really got the true picture of whether what you were doing was working. (Mona, Interview)

Summary

There is no doubt that the students valued the experts' and experienced peers' expertise and experience. Their recollected stories and/or their personal experience outside the simulations convinced them that expert help, in the form of advice, guidance, sharing, and tips helped to clarify many things, particularly problematic cases, or points of interest, and also led them to effective decisions. In the long run, through such practice of cognitive apprenticeship, the students will become more experienced and capable, growing from novice administrators into seasoned decision makers. To most of them, however, such cognitive apprenticeship learning was missing in the computer-based simulation. The technical side of the computer-based simulation, as some students pointed out, prevented the development of cognitive apprenticeship, and the intention of the computer-based simulation designers to have the students exercise responsibility were perhaps the two most important factors in preventing such cognitive apprenticeship from occurring during the computer-based simulation.

Collaboration: Interacting, sharing, and learning from others

The students regarded collaboration highly. Kathleen explained her interpretation of collaboration: “Collaborative is you and I talking now, eye contact… I need a person, I need an interaction, not just to hear your side…” (Kathleen, Interview). Copperfield believed that collaboration was “crucial” for information processing. Not having a collaborative work environment, Copperfield asserted, was creating one’s own ulcer (Copperfield, Interview). Shirley described her take on collaboration: "I understand how we do need to work together, I understand that the dynamic of the school is not just one person solves the problem; we all have a role…" (Shirley, Interview).

In one occasion, Monica pointed out that collaboration enabled her to share, and to unload things:

> The collaboration would be you with someone whom you could have those conversations with that are private, and that don’t go any

> further than the door, and that you can kind of unload sometimes when you feel the need to do that… So no, I didn't find that there was an awful lot of collaboration. (Monica, Interview)

As has been mentioned earlier, one of my conversations with Monica was on collaborative work. It was based on my observation of her collaborating with another student during a work session. Monica pointed out during the conversation that she was an advocate of collaborative work and had been practicing collaboration in her work as an assistant principal. The benefit from working with others, according to her, was that "…you get to know more perspectives than when you're working alone and get to know some of the things that you can't when working individually." She explained she would talk to a teacher when she had to deal with a student in that teacher's class. This way, she said, she got to know the student she was going to deal with, and she got to know more about the problem she was going to deal with. At the same time, Monica acknowledged, working with others collaboratively consumed more time than working alone (Casual conversation).

Mona thought that collaboration was both necessary and beneficial because humans are social beings that learn through networking, and interacting with one another:

> …it is supposed to be a learning experience and having that opportunity to share, and network, and dialogue…. We are social beings. We learn by our social interaction… sitting at the computer, and making decisions on your own, that's important, but I think there needs to be the other side where you are having that collaboration. (Mona, Interview)

The good thing about collaboration, according to Belinda, was that "…any decision I made is better with other people…" than individually (Belinda, Interview).

Shelia explained that the decision made via collaborative work was better because one could view things from various perspectives, while still reflecting on one's own. To illustrate this, she shared her experience of collaboration outside the computer-based simulation:

> I think collaborative work is excellent because for me, I sit down and I write down my solution. But then I'm always second guessing or reflecting, "What is the best decision?" and what I liked about the collaboration or the peer debriefing is that they sit down and I hear that other people had to say my deal, or they've taken my deal just a little bit further. I like that, I find out that, "Hey, I'm on the right track," or "hey, there's a little bit more that I neglected to say, and could add to the solution." (Sheila, Interview)

When it came to the collaboration in the simulation, some students were not sure whether there was any. When asked about collaboration examples in the simulation, Portland thought there might be limited cases but could not find one himself: "I found there were limited examples of collaborative problem solving demonstrated in the simulation itself. It seemed that there were more examples of where there wasn't, where there isn't collaborative decision-making provided." (Interview)

Kitty (Interview) was not sure whether collaboration was provided in the computer-based simulation:

> I think they think there's collaborative work. There meant to be some collaborative work. I think in the simulation when you get to hear the people talk, I think that's what they're hoping is collaborative. To me as a participant in the simulation, I don't feel that's collaborative.

Copperfield (Interview) pointed out that he did "…not get much of that (collaboration) at all…" in the computer-based simulation. Kathleen (Interview) was more straight on this: "…there was no collaboration…" in the computer-based simulation, she claimed.

Monica (Interview) did not find any collaborative work in the lab but she felt it necessary: " …sitting in the computer, and making decisions on your own, that's important. But I think there needs to be the other side where you are having that collaboration."

Summary

The students had a very high regard for collaboration. They saw collaboration as an opportunity for interacting with others, sharing different ideas, and building social networks. Informed decisions were likely to ensue, owing to collaborative work. No examples were provided as to collaborative work in the computer-based simulation, although a couple of the participants thought that there was limited collaboration in it. Most students reported to have experienced collaboration in the other parts (that were outside the computer-based simulation component) of the simulation, such as in the debriefing seminars.

Scaffolding: Enabling better ideas, effective decisions, and sustaining learning

As described earlier, scaffolding consists of various forms of help that are geared to support learners just when they feel most challenged or when their understanding is uncertain in the learning process. It assists the learner in overcoming barriers and supports the person in carrying on her/his work when that might have not been possible otherwise. Does such a function exist in the computer-based simulation? Some students believed that there was indeed some scaffolding provided in the computer-based simulation. The scaffolding, according to them, was provided in the form of resources, such as staff profiles, 'memory flash video clips, verbal documents, and other simulation elements. These all helped the participants to better understand the events and/or people at the school, or to deal with related issues more effectively (Mona, Interview; Belinda, Interview; Shirley, Interview). When asked about the relation between the scaffolding provided and her learning, Rosemary pointed out that the information she found in the embedded file resources helped her with better decisions:

> I think it makes it easier to form your decisions when you have more information. The more information you have from which you draw, the better informed your decisions are going to be… as you get more information, you are more able to make decisions that are going to be effective because you have the information. So, it does, I mean it does help your learning. (Interview)

What Rosemary probably meant was that the file resources consisted of documents that were closely related to the issues/problems encountered in the simulation. When she (and possibly other students as well) dealt with the issues/problems, the closely related documents seemed to be just what they needed – these documents appeared to have been tailored to her needs when she needed them most.

Students interpreted the scaffolding differently. Most of them saw limited, if any, scaffolding help provided in the simulation itself (Bush, Interview; Copperfield, Interview; Kathleen, Interview; Kitty, Casual conversation, Interview; Monica, Casual conversation, Interview; Portland, Casual conversation, Interview; Sheila, Casual conversation, Interview). Instead, they found quite a bit of help from the instructors in the work session, and a lot from peers during the debriefing seminars, which, of course, was outside the computer-based simulations which were the focus of this study.

Portland (Interview) did not find any scaffolding but thought it "…would be more helpful…" if scaffolding was provided in the simulation. He talked about how his impression had changed through the officer dealing with a suspected child abuse case: "Initially, I thought she (the police officer) was very helpful." Seeing how the officer was dealing with the case, however, Portland "…found that she potentially could be in a serious situation… I found her approach was very cavalier…" He believed that if some key person in the simulation could come up and provide him with related information, he could know "…to whom I could trust, put responsibility, or something."

Kitty also didn't see much help provided in the computer-based simulation. She did, however, receive substantial help from the instructors who taught the course. She thought this help was excellent, especially at the beginning of the course. As the class progressed, she found that less help was provided and less help was needed:

> I think there was a lot (of help). The professors are excellent. And I think there's a lot of assistance at the beginning. There's not now. But I think that's because we understand the procedure. I'm sure if any of us came up and said: "I don't get this," or "I need help," I'm sure they would offer their help. Or help yourself with the problem … [sic] So, yes, there are changes. They're doing less with us to instruct us to use the how program but I think that's probably because we know how to use it. But if we had a question, I'm sure they'll be helpful. (Kitty, Interview)

Summary

Depending on the students' background, they saw scaffolding differently. In general, they valued the scaffolding as a potential aid to enhancing their learning. Scaffolding to them was the right help provided at the right time, particularly at some critical moment. This would enable them to learn better, that is, to get a better idea of things and therefore make effective decisions as principals. They saw limited, if any, scaffolding in the computer-based simulation.

Research Question Two: Summary

In describing and interpreting student learning there were a number of the situated cognition elements which seemed to be important. Contextual information was seen as crucial for the students' deeper understanding of people, issues, situations, or any other parts of concern in the simulation. With the contextual information, the students were able to make informed decisions that were often appropriate and effective.

Authenticity was necessary because the students were able to deal with the problems of same magnitude and same challenge as they would in real life at school. They also recognized that many of the problems in the simulation do not happen very often in real life. In tackling those problems, the students were able to draw on their past experience while trying alternatives, which would potentially make them more capable administrators. Similarly, the challenging and life-like problems helped to prepare the novices for future roles as good, effective principals. As the peripheral members of the community of practice of principals, the students were rehearsing and practicing what they would do as a school administrator when they found a school culture that was weak and chaotic, how they would propose change, how they would actively engage in coping with a wide variety of problems.

Cognitive apprenticeship, collaboration, and scaffolding were all regarded highly by the participants as being able to broaden their perspectives, to provide expert help at some critical moment when they felt most difficult to carry on their work, and to start them thinking about their own problem solving path. All these, the students pointed out, would help them to become effective school principals. Yet, they were not found in the computer-based simulation.

Research question three: What could be done pedagogically, or by way of meta-cognitive development, to enhance student learning?

In the previous sections elements of situated cognition were identified, and the impact of those elements on student learning was examined. In this section I explore the students' thoughts about the course, about the computer-based simulation component in particular, and whether the course could further improve on its current success by way of meta-cognitive development. The two most frequently mentioned words during the interviews were 'feedback' and 'collaboration.'

Collaboration: Opportunity for thought exchange and learning from difference

Mona interpreted collaboration as "a learning experience and having that opportunity to share, and network, and dialogue…" She argued that we humans are "social beings. We learn by our social interaction" (Mona, Interview). Many students pointed out that they benefited from learning other people's, many times more experienced peers', or experts' view points. From these they got to know whether their own opinions were correct or not.

For Bush, collaboration meant people learning from one another as they worked or studied together. He saw it as an opportunity to look at things from perspectives other than his own. This way, he asserted, he could learn a lot. He observed that a school principal collaborated a lot in real life:

> I learned a lot from others. We learned from each other. I think that in many cases, I didn't think that there were very few cases where I had

> every, all the steps certain to find [sic]. Like make sure that I had this angle and what I would do, what I could do this, or I could do this, I could do this. There is always something I could have added to some other's idea… But as a principal of a major high school you have two or three assistant principals you can talk to, or deal with.
> (Bush, Interview)

As an assistant principal in her school, Belinda pointed out that collaboration was part of her job. She mentioned that whenever she set up to handle a student-related issue, she would first talk to the teacher who taught the student to get some first-hand information about the individual, then she might seek the teacher's input for a solution, or else get the teacher's feedback to her tentative solution. Belinda regarded this as kind of team work, or collaboration. She said that she "…talk[ed] to other people in a collaborative situation…" because there were always "…more experienced, more productive ways…" for problem solving (Belinda, Interview).

While valuing the merits of collaboration, the students suggested that collaboration, or team work, was lacking in the simulation:

> …it is very visual, and there are details so you can pick up the task-based sort of case, problem that a case wouldn't provide you. So I mean it has a certain in-depth richness to it and that's one step ahead of a text kind of problem. But it still requires group work so that we can look at it and people can put their different views on it, and then you might change your mind. I mean I changed my mind about a couple because I don't come to the problem with a full understanding of how to manage it. I know people have different ways, so when everybody shares, you can get a number of ways of coping with it.
> (Kathleen, Interview)

Kitty didn't find much collaboration in the computer-based simulation, although she was all for it and enjoyed it very much: "…any of us being successful in the university, or in the classroom at schools know how important building relationships and interactions are." She thought peer sharing was often thought-provoking. She hoped that collaboration could be provided in the simulation in a similar way to what she experienced in her small group debriefing discussions (again, outside the computer-based simulation), in which people shared their experiences and provided feedback for others. Thus, everybody contributed to the group work:

> So that there's more talking and more sharing. And it's not the same people talking all the time. I really enjoyed hearing about them… Because now I can think, "Well, gee, he's actually dealt with that, and this is how we dealt with it, but this is the consequence after." And these real people who experienced the real problem helped me put that in the context. So I like that part of the course, the debriefing, especially in the small groups… these people have real experience, you just think maybe your place should be [to] sit and listen. But… it forces you to add an opinion, which is valuable opinion. So I think it validates your own problem solving, as well. (Kitty, Interview)

Bush was a firm believer in collaboration. Working in the simulation, he did not have the opportunity to collaborate but believed that collaboration might be added to the work sessions so there could be more opportunities for people to work together, and to learn from one another:

> And the other thing I'd like to say is in the sessions themselves, a little bit more collaborative work, even if one of the sessions we got together with a partner, with someone we knew and we started at the computer together, and we say "Okay, this is the problem. What would you do?" I think I'm a big believer and proponent of

> collaborative practice. I think you learn a lot from working together. You can brainstorm different ideas. You can look at things from different angles in a totally different fashion, as you would possibly something else… But I also find that the whole art of collaborative practice is so, so important. It really makes it easy on you and it makes it easy on others. And it also gives people the opportunity for empowerment they feel that they're contributing. That's crucial in a school. It really is. (Bush, Interview)

Bush pointed out that working together with others was what he often did as an assistant principal in his school: "I talk to the teachers, I talk to the students, I talk to the parents. Right, if my principal was busy, I would make the decision. I would base my decision on this." (Interview)

Monica was rather frustrated because there was just no collaboration at all between Stephane, the assistant principal, and herself, the principal. She felt that Stephane was not "…someone who you could have those conversations with that are private, and that they don't go further than the door, and that you can kind of unload sometimes when you feel the need to do that." (Interview) In order for the learners to collaborate, Monica suggested the creation of a character in the simulation with whom Kelly could discuss things of concern at school - a "confidant" by her word (Monica, Casual conversation, Interview). The feasibility of Monica's suggestion, that is, how such collaboration could be done technically and whether or not and how it might work will be discussed in the chapter following this one.

Many students thought what they did outside the simulation, but as another part of the course, was collaboration and could serve as examples for collaboration within the simulation. Shelia, for example, talked about the communication between participants while working on problems in the work session:

> I think it would be an asset if you had some kind of way to communicate with the others that were working on their work sessions too. So if there was some type of email interaction that could happen while you're working your work session, or chat type of thing. I think it would be neat if there was something put into the computer-based simulation that you could talk to one of the other peers on the computer, even it was by email or whatever, but actually email one of and say, "This is the situation I've got, what would you do in the situation?" so that you could collaborate during the online work session. (Sheila, Interview)

Summary

As social beings, the students saw collaboration as a learning experience and an opportunity to share, network, and dialogue. For many of them, working collaboratively was part of their daily work at school. Collaboration not only enabled them to view things from different perspectives and find more experienced, more productive ways to solve problems; it also allowed people to release their concerns and share successful and/or unsuccessful stories. Although not found in the simulation, collaboration was advocated and some instances of collaborative work in the course outside the simulations were discussed for possible introduction into the simulations.

Feedback: Learning the consequence and thinking about thinking

The students were uniformly positive about the simulation. At the same time, they also thought there was room for improvement. One of the things the students thought most important for their learning was feedback to their actions and/or decisions adopted while dealing with problems in the simulations. Monica talked about the merits of getting feedback to her actions and suggested that the simulation might be even more effective if feedback was provided. Moreover, she believed that feedback, both positive and negative, enabled her to think about her own way of handling problems and her own way of management:

> The only thing that I think I would add to it is that if possible, is just to have in the simulation some kind of other feedback to know whether some of things that you're doing are working in the simulation. And I don't know whether I can do that or not, but, that would be the one thing. … It's certainly made me think of my own process of learning. But then again, for some things where I got feedback, positive feedback, from parents, or teachers, or students, then I knew that what I had done was appropriate. So I had learned in fact from some kind of reinforcement that what I was doing was working. And so, when you have that kind of feedback then you know that "Okay, this is a positive thing." But your learning also comes with knowing if you're consistently getting feedback that is not positive, or you do not see a change in the person or his behaviour or her behaviour, or the activities they are engaging in, then that also affects the learning in the sense of "Okay, well that doesn't work, what can I do next?" So certainly the whole scenario, the whole simulation constantly makes you think about how you're processing, how you're affecting people, what you can do better, or how you can make it work so that it begins to flow as a culture. (Monica, Interview)

Like the rest of the class, Copperfield was enthusiastic about the computer-based simulation and thought it beneficial to all of them, especially to those who had limited administration experience. Nevertheless, he noted a lack of feedback on his decisions:

> I can't think of anybody who wouldn't benefit from going through that simulation, especially if they had limited experience. I think the big thing for me is the ability to process afterwards with other people

> what you did, what you experienced, what you felt. For example, in the simulation itself there are staff members that are obviously very negative about how they handle problems. There's no interchange of ideas. I like to work with staff, as opposed to, you know, here's a solution, bang, hope you like it. And you don't get a sense of that in the computer-based simulation. It's highly responding, and you go from there next. So, I think maybe that element of it is maybe a little lacking. You know, like you hit problem number 10, you set the memo, you've done this, you've done that, hit problem 11. What happens as the result of your decision on number 10? (Copperfield, Interview)

For Shelia, feedback was the characters' reaction to the decision she made. She thought that she could personally benefit more from it. With the feedback, she could know the consequence of her act and make possible adjustments:

> If there was more reaction with the characters and more availability to say: "Here are your choices of what you would do." I pick one and I get to see the reaction. I think that would give me more life problem solving abilities because I'm actually seeing what the consequences of my choices are going to be. So it would be nice to be able to say, "Okay, if I did this, and then get some feedback on that, and then go for that, go on with that" because, you never know, you're suggesting a solution but you don't know how a person is going to react. So if you could, pick that, and then see the reaction. (Shelia, Interview)

Kitty pointed out that the feedback she looked for in the simulation was that which would start her thinking about her own learning, and, specifically, her way of solving problems. She recalled the feedback she got from her experienced peers in group discussions outside of the simulations:

> And I think specifically for me there's been tremendous growth in the

> last couple of classes where we get to small groups. So that there's more talking and more sharing. And it's not the same people talking all the time. And for someone who's never been an administrator… In the last group I was placed, all three of them are vice principals. So I got all their points of view, which might be slightly different than mine. But I really enjoyed hearing about them, and for me, there's a big growth there. Because now I can think, "Well, gee, he's actually dealt with that, and this is how we dealt with it, but this is the consequence after." Because now sometimes I can generate the alternatives from the simulation, but I don't know what the real-life consequences are afterwards. And these real people who experienced the real problem helped me put that in context. So I like that part of the course, the debriefing, especially in the small groups.
> (Kitty, Interview)

Summary

A student wants to and can see her/his marks after an exam. A worker can usually see the finished product at the end of the production line. Likewise, a student in the simulation wishes to learn how her/his decisions worked out. Students explicitly expressed their desire to know the consequence following their decisions. The feedback, or the consequence of their decisions, here was also seen to be a kind of scaffolding, or expert advice on how things proceeded, and where future efforts might be made. Such feedback not only allowed the students to see how effective their decisions were compared to those of the experts, but also, and perhaps more importantly, potentially started them thinking about their own thinking, that is, why they would approach the problems their way and the pros and cons of their own way.

Research Question Three: Summary

Collaboration is a learning experience, and an opportunity to share, network, or view things from different perspectives. Technically, collaboration would be manageable in the computer-based simulations. Yet, issues such as authenticity, conflicting roles need be resolved if collaboration is to be feasible and effective.

Cognitive apprenticeship and scaffolding allow participants to receive expert help at critical moments when they need help to carry on their learning. Such cognitive help does not necessarily mean to give the students solutions to their problems. More likely, a master provides a student with cognitive coaching in ways to look at and approach the problems that have puzzled the cognitive apprentice. Such help might be in different forms, such as feedback, questions, hints, or related resources. These could not only help the students resolve the problems that puzzled them but may also start them thinking about their own thinking, which may be more important than to simply solve a specific problem. Such cognitive apprenticeship and scaffolding were not perceived by the students in the simulation. Such help, again, is feasible technically but may prove to be a too huge undertaking for most individuals and institutions.

Research question four: Based on the current theoretical framework Of learning, constructivism in particular, what key elements of situated cognition could be added to those that already exist in the computer simulation course design ?

In order to generate as much input as possible, I asked the students for suggestions for improving the course as a whole, in addition to the computer-based simulations. Enhancement to organizational culture and cognitive apprenticeship was put forward for improving student learning.

Organizational culture: Empowering Kelly Goslyn, the principal

Many students thought the organizational culture at Aberhart Junior High was loose, and sometimes chaotic. Shirley saw this and thought that the organizational culture at Aberhart Junior High needed to be reinforced:

> …if somehow we can see a staff meeting that went on where the administrator, or maybe Stephane or some other leadership team is working with the staff and you can see them. How do they come together to the staff meeting? Can they get any consensus? Can they form a moral fellowship unit? Do they have certain values they believe in? How is it handled? How do they treat each other? Maybe have a staff in the meeting solving one of the problems. Could be discipline, I'd like to see a staff meeting on discipline. Somebody could say, "Yes, it's really wild value, what do you, does anyone else think so? What can we do? What do we want to do?" Some kind of group dynamic process, I'd like to see that, or may be part of it. Could be a little interviews. I don't know how you do interview when you can't talk to those people on the screen. But interview the staff members: "What's really important to you?" Because in the way you solve problems, you're also establishing a culture in the school, and you'd hope that it lines up with some of the others. So, something about that, if we can find out some about the people's values, and how they are building up dynamics, how they really view this, like there can be some big, big problem in the school and we can have a big staff meeting about it. (Shirley, Interview)

For Bush, Mona, and Monica the key to building a strong culture lay in themselves as principals. Instead of being pessimistic and complaining, Bush saw the lack of culture as an opportunity to build a strong leadership, to build his own vision of the school and its culture. He further explained that this could be done by empowering his staff, by bringing people around him and making them capable (Bush, Interview). Monica (Interview) asserted that she must take the initiative and function actively as a "…problem solver, or a facilitator, or an information giver." Specifically, Mona pointed out that some of the things she would do in building the functioning culture included setting "…some plans and actions that would allow for collaboration, allow for shared vision." (Mona, Interview) She was not sure, however, how those things could be done specifically in the computer-based simulation.

Copperfield saw the weak culture, too. He agreed that he as principal would take the initiative to strengthen the culture in the school:

> …to create a staff meeting, or a proposal for moving the culture forward in school, I want you to present those, I mean the group of three staff, would spend an hour presenting those, and then next day we'll choose one and run with it. And the rest of you can then provide feedback and how it felt to go through that process.
> (Copperfield, Interview)

He saw that in the existing program, Kelly was reactive, always busy putting out fires. Alternatively, Copperfield suggested that he could be programmed as proactive, as "…a pedagogical force…" able to help and guide others with his leadership and expertise:

> It's, you know, right now she's focusing on who's done it, who did this, who did that, and, "damn Archie, you will teach, you know." You do this, you will do that. But do we have a sense of who this person is as a pedagogical force in the school?
> (Copperfield, Interview)

Summary

Organizational culture meant leadership, responsibility, and initiative. Working as Kelly, the students did not find that a working culture existed in the school and felt that responsibility for the weak and/or sometimes chaotic culture lay mainly in themselves because they had acted passively. They felt it necessary and obligatory to actively promote a strong leadership and a functioning culture and then convey these to the staff of Aberhart Junior High School. Specifically, they talked about empowering their staff, about taking the initiative and showing strong leadership. No student was explicit as to how this was to be done technically.

Cognitive apprenticeship: Missed in the simulation

Kitty stated that she experienced a significant growth in the class outside the simulation when she listened to the more experienced peers' sharing of their stories of handling some of the problems that she was dealing with. She explained that the experienced peers' stories helped her put the problems in context (Kitty, Interview). Moreover, she found it especially beneficial to her to listen to her peers' comments on her problem's solution, pointing out to her the pros and cons of her solution. Kitty suggested having experts and/or experienced peers guide her with successful experience while dealing with some problematic and especially tough cases:

> …maybe to have experienced principals coming and talking about some bigger issues. Maybe talk a little bit on budgeting and I know that both instructors are experienced principals. And I often wish they would share just a little bit how they handled things, you know, sometimes they do, but I know that's not their focus. Because I'd really like to see how people who are actually working successfully in this field handle some of the big issues and what their

> opinions are. These all are ours although we have no experience or have little experience but I would like to see some of the key players. I'd like to see how they handle their problems. And I think for every successful model in leadership, there're probably a lot of strategies that didn't work for them, like there seems to be a lot to get in place. So, I would love the opportunity to work as a principal but also to hear other principals' points of view, to hear what experienced ones say, and maybe just on key items that we highlighted as a group we need help on. I'd like to know what they say… I'd like someone who really did it… We've got lots of alternatives. But I'd like to hear somebody who's got experience, what do they have to say?
> (Kitty, Interview)

As can be seen, students (such as Kitty) indeed found the existence of cognitive apprenticeship in parts of the course outside the computer-based simulation. In the simulation itself, however, they did not find any cognitive apprenticeship as there was no structure through which they could learn things from characters in the simulations. As a result, some students thought it necessary and helpful to bring into the simulation some figures who could offer such expert advice.

Kathleen was one of the students who suggested that it would be helpful to bring a positive model into the computer-based simulation so that their learning might be enhanced: "… I'll talk maybe some positive models right there in the simulation, for example…There's a lot of interesting research that could shed some light on the way of dealing with the problem, or why problem occurred…" (Kathleen, Interview). What Kathleen possibly had in mind was to borrow some examples of cognitive apprenticeship from research or other sources and put them in the computer-based simulation in the format of either text or video. Along with the logic, students might have a better idea as to how the problems are to be resolved while referring to the examples in the computer-based simulation. What Kathleen did not talk about here was how the cognitive side was going to occur: Cognitive apprenticeship involves cognitive exchanges between a master and apprentice over problematic and/or especially difficult cases. It is not simply the mimicking or following of the expert/experienced peers in apprenticeship learning.

Copperfield thought that in the existing program, Kelly Goslyn might serve as a role model of leadership to help and guide others, rather than being busy putting out fires:

> But… Kelly really had a chance to step up play and show the staff that this person actually has a lot of technical knowledge about teaching. It's, you know, right now she's focusing on who's done it. who did this , who did that, and damn Archie, you will teach, you know. You do this, you will do that. (Copperfield, Interview)

Summary

The students experienced and benefited from cognitive apprenticeship in parts of the course outside the simulations. They believed that in the face of problematic issues and especially difficult problems, the guide of expert advice and sharing from experienced peers would enhance their learning and enable the course as a whole to be even more successful on top of its current success. Cognitive apprenticeship was not seen in the simulations themselves. Suggestions for incorporating examples of cognitive apprenticeship into the simulation model were put forward and having experienced peers play the role of cognitive master were expressed. It was even suggested to have Kelly play cognitive master in some cases. It remained to be described how cognitive apprenticeship could be carried out from a technical and design point of view.

Research Question Four: Summary

Culture was seen as weak and should therefore be strengthened to offer something that students would want to be a part of. Specifically, the participants suggested strong leadership, responsibility, and initiative as essential elements for culture building and that Kelly might be programmed into playing such a role as a strong leader. For example, Kelly might take some initiative and empower the staff for culture building. No detail was provided as how culture building could be implemented technically. Cognitive apprenticeship was seen as critical to enhance the participants' learning and to make the simulation even more successful. Suggestions were made to have some cognitive apprenticeship learning opportunities placed within the simulation. It remained a question as how it could be done technically.

Chapter summary

In this chapter, data were analyzed against the four research questions. As was discussed earlier, all students could see the presence of some elements of situated cognition in the simulation and could identify them, although they differed slightly in terms of the specific items they thought relevant. Out of the six elements of situated cognition, three were identified as existing in the computer-based simulation component of the course: contextual learning, authenticity, and, weakly, enculturation. Contextual information, for example, was identified as being provided in the form of textual, audio, and video files in such items as 'the orientation and practice', 'short introduction', 'staff profile', 'memory flash', and embedded file materials in the computer-based simulation. The realism of the simulated problems was appreciated as life-like, representing the multiple facets of a school principal's day, and was therefore a substitute for some life experience. At the same time, though, it was pointed out that printed copies of policies, regulations and other documents would be closer to current practice than were computer files. As well, the intensity and severity of the simulated problems appeared overwhelming to most students, although the breadth of experience was one of the design features of the Project Decide. For enculturation, most students felt the existence at Aberhart of a loose culture characterized by disorganization and lack of leadership. The students, consequently, did not feel they could embrace it. The remaining three elements, scaffolding, cognitive apprenticeship, and collaboration, were believed missing from the computer-based simulation component by most students, but were claimed by some participants to have been found in the debriefing sessions.

The students were all positive, in fact very positive, about the effects of the three elements of situated cognition on their learning. They were not, however, as positive about the effects of the three elements that they found missing in the computer-based simulation, as was previously analyzed.

One of the most important elements that the students found missing and thought necessary to add to the simulation was collaboration. They thought that collaborative work enabled people to view things from various angles, and many times started people thinking about their own thinking and problem solving. (Bush, Casual conversation, Interview; Belinda, Casual conversation, Interview; Cynthia, Interview; Copperfield, Casual conversation, Interview; Kathleen, Interview; Kitty, Interview; Mona, Interview; Monica, Casual Conversation, Interview; Portland, Casual conversation, Interview; Rosemary, Interview; Shelia, Interview).

Another suggestion the students put forward was the addition of expert advice to the work sessions, as an integrated part of the course. They believed that such expert advice could be provided in the form of feedback and peer sharing, such that the students would be able to see the consequence of their decisions. According to them, advice from experts and/or experienced peers would not only enable people to see the results of their work, but, also, and more importantly, to see their own limits and thus think about the difference between their way of problem solving and that of the experts and experienced peers.

Organizational culture was seen as weak and should be reinforced. A successful model of problem solving or capable leadership modeling displayed by Kelly Goslyn was proposed. In both cases a strong leadership would be shown in some aspects of the simulation so that people had some core values to follow, and, hopefully, assimilate. The dilemma here was that if there had been a strong culture at school, if Kelly had been capable, the issues and problems could have been easily handled or would not have existed. Consequently, there would have been few things for the students to deal with and the design feature of the exercise of responsibility would be lost.

Chapter Five: Discussion

In this study, I explored selected elements of situated cognition as they were identified in EDPS 501, a graduate course on school administration offered at the Faculty of Education, University of Alberta. Specifically, the study examined the students' perceptions of the situated cognition elements in the computer-based simulation component of the course and in the course as a whole, including the effects of the elements on individual learning. In this chapter I discuss the main findings, drawing on the previous chapter, and propose areas for future practice.

This study showed how the elements of situated cognition in the computer-based simulation may help students with their learning. The findings, reported in the previous chapter are helpful in identifying the potential of situated cognition in computer-based simulations, both in terms of what has been done and what may be done in working towards a highly effective learning environment. In this chapter I will further explore the implications of these findings in terms of the six critical elements of situated cognition which have been the basis for my investigation.

Contextual information: Setting the stage for effective learning

The importance of contextual information in representing problems has been long pointed out by such scholars as Brown and Duguid (1995), Choi and Hannafin (1995), Jonassen (1999), and Tessmer and Richey (1997) who argue that contextual information is an essential part of problem representation. Learning, according to them, is a natural by-product of the relationship between individual and environment. This study shows that the students held a very high regard for the elements of situated cognition present in the computer-based simulation component of the course. Of these, many students felt that background/contextual information was an indispensable element. (Bush, Casual conversation, Interview; Copperfield, Interview; Kathleen, Interview; Mona, Interview; Monica, Casual conversation, Interview; Rosemary, Interview; Shirley, Casual conversation, Interview) For example, Cynthia doubted whether everyone in the class would "…be able to get through it (the computer-based simulation) without contextual information…" (Cynthia, Interview). For Kitty, contextual information was essential for it not only got her started but also enabled her to understand the teachers: "That's exceptional. I don't know whether I could start the simulation without it…. Obviously, I think that's necessary. It's excellent and it's necessary because how else would I get to know and understand the teachers?" (Kitty, Interview)

The contextual information was essential also because it enabled the students to immerse themselves in the people and events at the school, allowing them to see the existing problems and how they came into being. The background/contextual information set a stage and helped develop a mind-set that allowed students to grasp the essential elements of the problems. (Bush, Casual conversation, Interview; Copperfield, Interview; Kathleen, Interview; Mona, Interview; Monica, Casual conversation, Interview; Rosemary, Interview; Shirley, Casual conversation, Interview)

Contextual information not only set the stage for the students, it also contained cues that would direct students to sources of clarifying information and lead students to solutions for the problems with which they were dealing. Brown and Duguid (1996) described learning with two different analogies: wall construction and painting. They argued that effective learning should not be like the construction of a wall, in which a brick is simply added to an existing wall. Neither, they pointed out, is learning the simple mixing of one colour into an already existing colour in a painting to produce a different colour. Rather, in learning, many peripheral features of a situation blend to collectively make sense for the learner, in the way various colours may result from different blendings of the three primary colours (Brown & Duguid, 1996). Therefore, "Any decomposition of the task… must be done with an eye to the learner's need to situate the decomposed task in the context of the overall social practice." And that "…it is vitally important not to fragment the social periphery…" (Brown & Duguid, 1993, p. 12).

This assertion of the significance of background and contextual information to learning was echoed in the students' recollection of their experience in the computer-based simulation (Kathleen, Interview; Mona, Interview). They believed the contextual information added uniqueness to a scenario. The uniqueness of each and every scenario/story made one scenario differ from another. The solution to each and every one changed accordingly. In order to make an informed decision, therefore, one had to examine contextual information closely, as was recollected by some students:

> …each story and each scenario has its own special sort of flavour to it. A solution that suits one may not suit another. So that's a good lesson. There could be one element that could change how one manages problems. So one takes away from that in terms of knowledge. You need to be quite flexible and experienced and knowledgeable in order to manage the onerousness (sic) of the problem. They are varied, and each one can be dealt with differently… Yeah, that's what those details do. I mean, they show the complexity that we can find in a problem, something we hadn't thought of.
> (Kathleen, Interview)

Mona, another student, recalled a similar experience regarding the usefulness of contextual information in the computer-based simulation. She believed that such information

> …brings to attention that you can't look at the things on the surface; you have to dig for the information and make sure you go to all the approaches, approach all the parties that are involved so that you can make an informed decision. (Mona, Interview)

Jonassen (1997, p. 80) contended that "…ill-structured problems interact with and so are constrained by contextual factors." Interacting with and constrained by such contextual factors such as the complexity of situations, the complexity of the problems, and the people involved, learners would better understand when to use particular resources or problem solving strategies, how they may be used, and why they should be used (CTGV, 1992). Students offered concrete examples from their experiences handling simulation problems to support this idea. For example, Rosemary valued contextual information highly and thought that she would manage things very poorly without it. She shared with me her experience in dealing with Barry Ghetti, grandfather of a student. In the computer-based simulation, Ghetti stormed her (Kelly's) office because of his grandson's injury. The grandson's knuckles were swollen and cut, likely the result of conflict between his grandson and another student. As soon as Rosemary (as Kelly) saw the grandfather, she said to herself: "Oh, I heard about him and I know now that I have to deal with him in a certain way if this is going to be positive" (Rosemary, Interview). Rosemary was cautious because she remembered that earlier on one of her colleagues in the simulation had warned her that this grandfather would advocate strongly for his grandson in any situation. She also looked at his file, and the file letters provided in the simulation to see what sorts of behaviours his grandson had been exhibiting and what other problems his grandson may have had. With the colleague's early warning and the information she got from the files, she felt she had a good idea about the grandfather and knew she needed to have the grandfather on her side or they would get nowhere. She was thus better prepared when facing the grandfather. The contextual information provided in the computer-based simulation, as the example illustrated, was essential for her understanding of the situation and affected her decision making:

> You're decision making [sic], you're not going to act with no background information. …Sure, it helps a lot my understanding of the problem [sic]. With Mr. Ghetti, you kind of think, oh, he's a little bit crazy. You already had that, so you know that, you have to deal with him in a certain way. Just like as a teacher I get to know that certain parents need be dealt with in a certain way in order for it to work.
> (Rosemary, Interview)

Moreover, for some students the contextual information was indispensable because the policies and regulations enabled them to see which were legitimate things to do and which were not, which added to their confidence:

> There is the Child Welfare Act. There is the School Act, there are those video clips. There is that handbook. All those things you couldn't do simulations without them, they let you see the boundaries of what you can do, what you can't. You have to hold that stuff prior to bringing your thoughts to each simulation. (Belinda, Interview)

> I don't know a lot, a lot of different policies, even the Child Welfare Act. I don't know a lot of them. So, I find those very useful. It gives you more confidence in your decision if you can base it on, or ask what you know, it backs up your decision. (Rosemary, Interview)

The students' experience with the embedded file materials conforms to the findings reported by Mappin (1996):

> The richness of the context adds legitimacy to the simulations in an almost intangible way, providing a level of security for students, while serving as a reminder that work is done in the context of legislation, policy, and previous activity. (p. 152)

In summary, there were recognized background/contextual elements in the computer-based simulation of Aberhart Junior High. Although they were as varied as the specific problems presented in the simulation, the students' responses showed their appreciation for the presence of those elements. It should be emphasized that these elements of background/contextual information were not a simple addition of more information to the existing computer-based simulation. Rather, they were essential parts integrated into design of the problems from the outset. They were like different colours blended to create a certain hue from which no component colour could be removed without there being a change in colour. The background/contextual elements thus provided rich information related to the issues being dealt with by the students and set the stage for problem solving while showing the history and complexity of the problems. The background/contextual elements also pointed out boundaries to the students for their actions. The background/contextual elements, as Mappin (1996) concluded, were able to "…provide a circumstance where students cannot simply invent character traits or political alliances to justify what they have done." (p. 234) We may say that background/context, as an element of situated cognition, played an important role in fostering perception of their learning and that without it learning may be affected adversely. Technology was able to present the background/contextual information in a variety of formats, enabling effective communication of information.

Authenticity: True to life problems and déjà vu

'True to life' and 'very realistic' were some of the expressions the students used to describe their appreciation of the realism in the computer-based simulation. Their expressions reflect the ideas of authenticity by Jonassen (1999) and Savery and Duffy (1995), who argued that authenticity is provided by the learning tasks that replicate a particular activity structure and represent the same type of challenges as those existing in the real world. Many of those activity structures which were replicated and the challenges that came with the related true-to-life problems appeared familiar to the students from their lived experience. Either they were similar to what the students had personally dealt with at some time, or they were similar to incidents the students had heard described by their colleagues. Monica, an assistant principal with extensive experience in school administration, pointed out that she felt the problems presented in the computer-based simulation were " very realistic" and quite similar to some of the issues she had dealt with herself in real life as an experienced school administrator:

> I thought they were very realistic, … I have dealt with a number of issues that have been quite similar to some of the ones in the scenarios, and have heard from other people about some of the ones that are familiar to them, so I think it's very realistic.
> (Monica, Interview)

Similarly, Kathleen found resonance to the realism of the representation of problems in the computer-based simulation. She also found the represented problems "very realistic" (Kathleen, Interview). Such life-like problems, as Brown et al. (1991, p. 7) have contended, seemed to be "…coded by and connected to the activity and environment…"

and required various resources to address. There was no shortage of evidence in this regard. The students not only found the problems represented in the simulation component of the course very realistic, familiar, and commonplace, they also found them to possess the same challenges and complexity as they had encountered in their real school experiences. Kathleen, for example, said that the problems were so real sometimes that she experienced "…a kind of surprise…" when encountering such life-like problems because they were out of her expectation. At the same time, she felt that it was a good thing to have exposure to such a range of problems and claimed that a "…good correlation…" existed between resolving a variety of life-like problems and her problem-solving skills (Kathleen, Interview).

Since the problems were real and sometimes surprising, there were often no readily available solutions to them. Frequently, a student had to refer to various resources in attempting to resolve difficult problems:

> I think they were very, very realistic. It was very apparent that some of those scenarios were exactly what was happening out in some of the public schools. So it was very pertinent. They are not abnormal at all. A lot of time, you have to talk to the parents, you have to refer to the related policies or regulations to make a good decision. (Mona, Interview)

A feeling of realism towards the problems in the simulation was not limited to the students who had been school administrators. Students who were teachers also appreciated the true-to-life nature of the simulation problems based on what they had seen and heard in their lives:

> I think they are right on. I think there's more negatives than you maybe deal with in one day but in the span of your career you'll

> definitely be dealing with all those sorts of things. The intensity of the problems, I was aware of that because I heard some similar stories at school. I must say I was a little bit panicked when we first started in the computer lab. But it was good and necessary, it's a rehearsal of what we will be doing at school. (Kitty, Interview)

The replication of real-life problems and familiar scenes aroused students' feelings of déjà vu, that sense of having seen and/or dealt with a similar thing before. Consequently, the students felt a desire to make use of past experience. Chris was one of the students who felt this way and made use of his actual experience to solve similar problems in the computer-based simulation:

> I recalled the similar situations that I had encountered at school. A lot of the decisions I make are based on things I've done in the past. The solutions immediately come to me. They may not be exactly the same. I mean the situations that I'm dealing with may be different than the ones I did at school. So I would adjust my solutions. I think other people in the class can't help to do that. We make use of our past experience, especially those with positive outcomes. (Chris, Interview)

For Portland, previous experience cautioned him to be vigilant when he saw strange behaviour in the students:

> I certainly did, even as late as last session, where you had the situation where you had the students obviously on some kind of drugs. I've had those sort of things happen to me. I recalled the situation where I walked down the hall way and encountered a student acting strangely. You knew something's not right. You had to be little careful about how you would handle all those sort of situations. There would be a serious, negative backlash if you made wrong accusation. Those sort of things are happening in real-life situations. So, it certainly brought back the memories of my days as a principal. (Portland, Interview)

The students did not simply copy their past experiences, as they might not be all successful or ideal. Instead, many of them took the opportunity to try alternatives with the hope of bettering their solutions, or improving their problem-solving skills. As Monica pointed out:

> ...because we are human beings, we learn from our mistakes. Sometimes some of the things I may not have dealt with exactly the way that I wanted to. When I reflect or write down my day, I think Okay, I would have done that differently. This gives me an opportunity to actually do it differently. (Monica, Interview)

For the students who were novices, or less experienced school administrators, the life-like problems were also beneficial. They thought the problems enabled them to truly see what a principal had to deal with and thus prepared them to encounter similar problems. As Mona described:

> I think it's beneficial that we experience them in the simulation before we actually experience them in the real life. Just being involved in that scenario and having that experience allowed me to be active in the real world, feel more confident about making those decisions, and feel more comfortable, and gave me some different channels as to which ways I can go, and different steps, so that I thought it was very positive. I think that you feel more comfortable about making that decision because you've already experienced it in the simulation. It might be a different taking [sic] on the scenario because it might be slightly different. But I think you're more comfortable and confident to make that decision and the learning is there with regards to it's familiar now, it's not foreign to me. (Mona, Interview)

Mappin (1996) reported that most students in the simulation of Pembina Elementary School were very positive about the simulation, about the problems presented in the simulation in particular, and found the simulation to be an experience that could replace a work experience. Resolving problems in the simulation, the students were able to "…suspend their disbelief," (Maynes, Mappin, & McIntosh, 1998, p. 1) to "…carry out conversations with the world of practice," and to "…become the principal of the simulated school…" (Maynes, McIntosh, & Mappin, 1993, p. 21). Apparently, the simulation of Aberhart Junior High School inherited this merit of being authentic and realistic. Naturally, it was also appreciated by the students.

McLellan (1994, p. 8) argued that in situated learning models the learning context "…can be the actual work setting, a highly realistic or 'virtual' surrogate of the actual work environment, or an anchoring context such as a video or multimedia program." The computer-based simulation of Aberhart Junior High School showed that it was possible to create a work experience for the students through a series of anchoring video presentations. Dealing with problems that were familiar but as complex and challenging as they are in real life, the experienced school administrators could not help feeling a sense of familiarity and making use of their past experiences. For less experienced or neophyte administrators, coping with true-to-life problems in the computer-based simulation was a rehearsal of what would be dealt with in their careers. Authenticity, therefore, constituted an essential part of learning that may have effectively advanced the students' learning in the computer-based simulation environment.

Enculturation: A process of adapting and creating

The students almost uniformly agreed that they were able to appreciate the culture of Aberhart Junior High through their daily encounter with the teachers, staff, and students at the school. Their responses supported Lee and Smagorinsky's (2000, p. 2) argument that "Individuals are connected to cultural history and its manifestation in everyday life." The manifestation of a cultural history in everyday life means the manifestation of the dominant beliefs and values of the community. It means learning and making sense of how the majority of people in the community of practice deal with things at school daily, what they talk about and how they talk about things happening. One might say it provides the connotation for what they say. Specifically, when students greeted the staff and students along the hallway, when people came to them with problems, when they met the district superintendent and listened to his briefing on Aberhart Junior High School, they began to appreciate and understand the values and beliefs in the school. Rosemary, for example, approached the community of Aberhart Junior High "...by talking to those people that you phone, and by seeing your staff in action, and by seeing them coming to your office, carrying a student..." (Rosemary, Interview). Like Rosemary, Cynthia also learned the culture of the school through her direct contact with colleagues in the school: "I... met the teachers, heard them talk, either directly to me or sort of within earshot, the culture that I accepted was through their comments..." (Cynthia, Interview).

Along with their familiarity with the school and its culture, the students had some difficulty with the culture at Aberhart Junior High because it was hard to accept how people thought about and dealt with things there:

> … That I found that a little bit frustrating as: how did they organize? What was as special when you first started? Why was the discipline such a mess? Why did they not have more organization for that? Why was everyone acting so disrespectfully, even teachers? (Shirley, Interview.)

Many students, including many of those who were actually experienced school administrators, were frustrated by the constant bombardment of problems. They felt like they were sitting on a hot spot, with people coming all the time with all those problems: "The fact that a large number of people are coming to you, you know, it feels like you're sitting on a hot seat. Butts are always on fire." (Copperfield, Interview)

Enculturation does not mean being passively assimilated. In addition to enculturation, the learning process is also composed of active individual construction of culture, of the beliefs and values specifically (Cobb, Gravemejier, Yackel, McClain, & Whitenack, 1997). Active construction means some change may have to be attempted within the community. It means some existing practice at Aberhart Junior High School may need to be replaced. Situated in the hot spot, the students felt they should not passively adopt the established values and practices in Aberhart Junior High School. Instead, they felt the necessity and urgency for change. The students' desire for change was legitimate because the community itself can be, and often is "…fragmented, and contentious…" (Brown & Duguid, 1996, p. 53). It is change that enables the progress of the society, of the human being. Changes in knowledge and action are central to learning and knowledge is "…routinely in a state of change... in the medium of socially, culturally, and historically ongoing systems of activity…" (Lave, 1993, p. 17). It is only in the process of change that the active individual construction of meaning is exercised.

The students did exactly that. They wanted to actively construct meaning, to enculturate themselves in Aberhart Junior High School in a positive way:

> I wanted, as a principal at that school, I wanted to change some of the things that I saw. And I think that's going to help me become part of that assimilation. Because I wanted them to be different because of the behaviours and things that were happening in the school.
> (Monica, Interview)

The students not only talked about change, some of them already had an idea as to what specifically they wanted to change. One of the things Bush wanted to change, for example, was to prioritize things to be handled at school:

> Sometimes, you have to say that: "I'm sorry, Stephane, but you're going to have to wait and see me at maybe three fifteen. Can you deal with this now and tell me what you've found out?" Talk to this person, talk to that person, and then deal with more immediate problem. You have to categorize what's the more important problem. If someone comes to your office bleeding, obviously, you have to deal with that first. It's the priority system. You get other people involved.
> (Bush, Interview)

The students seemed to have assumed the role of Kelly Goslyn, the new principal of Aberhart Junior High School, and many of them found the existing culture at this school to be loose and sometimes chaotic. Many students felt the urge to try to change the school's culture because it was simply frustrating to see things as they were. In this regard, what happened in the earlier simulation of Pembina Elementary School may shed some light on how students could approach changing school culture in the simulation of Aberhart Junior High School. In the Pembina simulation, such activities as "…collective problem solving, displaying multiple roles, confronting ineffective strategies and misconceptions, and providing collaborative work skills..." were practiced during the debriefing session, which suggested an enculturation process (Mappin, 1996, p. 191). While these actions took place outside the simulation they did provide students with some satisfaction.

Some students in the current simulation suggested that, when building a strong culture into which people would be willing to enculturate, Kelly Goslyn could be programmed as a capable leader and a team builder. As a capable leader, Kelly would gather a group of people and support them in becoming more capable, to the extent that was possible. On a couple of occasions, for example, Kelly and her/his team might hold a meeting to discuss some important issues in school like policy, regulations, or solutions to certain problems. Here Kelly and her/his team could be engaged in similar "...collective problem solving, displaying multiple roles, confronting ineffective strategies and misconceptions, and providing collaborative work skills ..." as were practiced during the debriefing sessions in Pembina simulation (Mappin, 1996, p.191). In such activities the team members would approach and try to resolve issues with their own tactics and strategies, to persuade others or be persuaded by others. One such meeting, for example, might deal with Robert's bike riding in the community. Robert Rusniak is a physical education teacher and is generally a capable teacher, well liked by most students. Yet, he was sometimes seen riding his bike shirtless in the community. The meeting might discuss the consequence of his such behaviour in a relatively conservative community, and his good relationship with the students at the school. A student working in the Aberhart Junior High School simulation might work in two different group situations, in one working as Robert, sharing with the rest of the group why he did what he did. In another group each student, now might play the role of Kelly, the principal, and share her/his view on Robert's behaviour, referring to his good relationship with the students and how it can be extended into other areas of work, including his conduct in the community. The performance of individual students in these activities may display their talent, and would allow other students to help them move toward realizing their potential. At the same time, Kelly (played by several students individually) as a capable leader would be leading the staff to build values that may be shared by most, if not all, school staff as played by the remaining students in the class.

Following the logic postulated by the students, these collective activities mightbuild a kind of collective sense of belonging at Aberhart Junior High School. They might feel a necessity and obligation to act implicitly and explicitly in accordance with what is generally accepted in this evolving culture. A positive culture might thus be built and the students may be more willing to enculturate into such an environment.

What the students suggested about building of a strong culture certainly painted a rosy picture, but may prove implausible for several reasons. First, the intention of enculturation in the simulation was to initiate novice learners into the community of practice at Aberhart Junior High School while solving authentic problems. In the simulation the students were learning to work effectively as the principal. In this regard, enculturation had reached its goal to a limited extent. Most, if not all, students acted as if they were really the principal in this community of Aberhart Junior High School. When they found weaknesses existed in this community, when they felt the necessity and urgency for change, when they put forward suggestions for change, they were doing what a principal would do at the school, accommodating the values, beliefs, socio-cultural expectations, and customs of those at the school and actively involving themselves in negotiating changes. (Barab & Duffy, 2000; Jonassen, 1997; Wenger, 1998) Secondly, the simulation was intended to provide an environment in which the students as novice learners could exercise responsibility by learning to solve authentic problems independently. When it was suggested that Kelly be programmed as a capable principal in ways such as organizing a staff meeting in which Robert shares his perception of riding his bike in the community and Kelly's discussion of extending Robert's good people skills into other areas of work, it implied that the students would all be capable as they acted as Kelly. As such, it would make no sense for students to take the training at all: The very purpose of the simulation, and, the course as a whole, was to train the students to become effective school administrators. If there was nothing to learn since they could engage the staff effectively in resolving any issues/problems encountered there would be little need for the simulation or the course. Thirdly, the inconsistency of Kelly being capable in a couple of cases but a novice in the rest could result in a confusing picture: Who is the real Kelly? the capable one or the novice? This inconsistency would potentially make the simulation seem unreal. One just can't imagine an administrator acting competently and professionally in a couple of cases and then appearing panic, inactive, or unsophisticated the rest of the time. Last but not least, it may be extremely difficult, if not impossible, to make incapable staff members capable in the computer-based simulation. Indeed, there were staff members in the simulation who always brought problems to Kelly and might therefore be considered incapable. But it is impossible to change them to make them more capable because they can not interact with Kelly. Their behaviours had been filmed earlier and they behaved as had been scripted when the video was shot. For example, how would Stephane be made capable suddenly when people were accustomed to seeing him as the one who did not resolve problems but always brought problems? Some fundamental change in design may have to be made if such transformation is to happen. Most importantly, the 'culture' in the simulation operated at two levels: the culture at Aberhart Junior High School, and the culture of the learning group, the students as a discussion group and class. 'Enculturation' may be seen to easily apply to the latter, the class arguably became a community of practice of school principals in which the students were enculturated. When these individual students were independently resolving problems in the simulations, however, they were learning to become principals. When they were exchanging ideas, sharing experiences, helping or being helped by others, outside the computer-based simulation component, but inside the course, they were cooperating and collaborating as school principals do. Students might be frustrated by the difficulty they encountered. They might be disappointed by the results they got from their decisions. They might feel helpless because of a lack of information, or they might lose their hope because of isolation. All these, however, were, are, and will continue to be what real-life principals experience. As for the intensity of the problems in the simulation, this seemed necessary because it helped to address 'the breadth of experience' of the students and 'the exercise of responsibility', two design features of the Project Decide. (Maynes, McIntosh, & Mappin, 1992)

On scaffolding: In need of the right help at the right time

Scaffolding, in the sense of situated cognition, is a supporting structure, base, or outline for learning. It is the "…process through which learning efforts are supported…" by various means (Hannafin, Land, & Oliver, 1999, p. 131). Scaffolding is usually provided in the form of context based help to the students, particularly in the initial stage of their learning, or at some critical moment when they feel most pressured. The help may be phased out as the students' learning progresses. Although the designers of the Project Decide did not purposefully incorporate scaffolding techniques in the computer-based simulation of Aberhart Junior High School, it was of interest to find out if the students perceived the presence of scaffolding techniques.

As has been previously discussed, the students found that little, if any, help that could be called scaffolding was provided within the simulation. This did not mean that they did not need such help, or that they did not appreciate such assistance. In fact, they expressed their appreciation for what they thought was scaffolding. In interviews and conversations, many students talked about their appreciation for the embedded file and memory resources and believed that those resources helped them tremendously to focus on their experience and to carry on. (Bush, Interview; Kathleen, Interview; Portland, Interview; Mona, Interview; Belinda, Interview). For example, Rosemary pointed out that the embedded documents and policies in the pulldown menus and the related conversations in the video clips helped her "…get all my panic out of my system…" and "…settle down to a real work session…" (Rosemary, Interview). The implication was that she might have long given up without such support.

Could those embedded resources be interpreted as playing some function of scaffolding since the students felt that they facilitated their learning effort? The resources were provided as resources, that is, as information only. They were not geared to help specific individuals and were not phased out later on. There was no human presence in the resources stretching out to help the students with their especially difficult problems.

In a strictly constructed sense of situated cognition, therefore, they could not be counted as scaffolding.

Many a time when encountering some especially difficult problems that could not be resolved independently, the students turned to the instructors for help, not to any other resource embedded in the simulation. Several students pointed out that it was the help from the instructors that enabled them to work on their program smoothly (Belinda, Casual conversation, Interview; Cynthia, Interview; Kitty, Casual conversation, Interview; Mona, Interview; Monica, Casual conversation, Interview; Rosemary, Interview; Shelia, Casual conversation, Interview; Shirley, Casual conversation, Interview). The timely help from the instructors was indeed encouraging, and in some cases helped the students carry on with their learning. Yet the help was more related to issues and problems outside the simulation but within the course, and probably had little to do with the problems the students were resolving inside the simulations. The help from the instructors, therefore, may not be considered scaffolding and was outside the focus of this research in any event.

One possible source of help that was repeatedly mentioned and very valued was feedback or consequences. Many students felt that their learning would be greatly enhanced if feedback or the consequences of their decisions were provided following their decisions. They wished to have feedback as it would be geared to their specific needs, helping to identify the positive and negative aspects of their decisions and the possible directions for further action. Copperfield was one of those who felt a lack of feedback on his decisions:

> I think the big thing for me is the ability to process afterwards with other people what you did, what you experienced, what you felt. For

> example, in the simulation itself there are staff members that are obviously very negative about how they handle problems. There's no interchange of ideas. I like to work with staff, as opposed to you know, here's a solution, bang, hope you like it. And you don't get a sense of that in the computer-based simulation. It's highly responding, and go from there, next. So, I think maybe that element of it is maybe a little lacking. You know, like you hit problem number 10, you set the memo, you've done this, you've done that, hit problem 11. What happens as the result of your decision on number 10? Or should you go and collaborate with one of your staff members first before you, you know what I'm saying? That (the consequence of your decision) is sometimes a little lacking. (Copperfield, Interview)

The students valued feedback highly. Their comments appeared to be in accordance with Clancey's (1997) view that feedback plays a principle role in knowledge construction. He argues that feedback coordinated "…activity within activity itself…" so that "…the flux of sensory data was changed, perception and conception were dynamically coupled, and goals and meaning were reconceived as transformations made to the environment over time were re-perceived." (P. 4) Feedback, therefore, might assist people in their efforts of resolving issues and problems when they need help most, and consequently, might facilitate their acquisition of knowledge.

Many times I feel it is difficult to distinguish the line between scaffolding and cognitive apprenticeship. To me, the students' descriptions of feedback, especially the function that feedback played for them, could be better interpreted as cognitive apprenticeship because the feedback provided, according to some students, was not straight answers but approaches to problems. The students believed that more feedback would enable them to think about their way of handling problems and their approach to management. They believed they not only benefited from positive feedback but they could benefit from negative feedback, too:

> The only thing that I think I would add to it is that if possible, is just to have in the simulation some kind of other feedback to know whether some of things that you're doing are working in the simulation. And I don't know whether I can do that or not, but, that would be the one thing. It's certainly made me think of my own process of learning. But then again, for some things where I got feedback, positive feedback from parents, or teachers, or students, then I knew that what I had done was appropriate. So I had learned in fact from some kind of reinforcement that what I was doing was working. And so when you have that kind of feedback, then you know that "Okay, this is a positive thing." But your learning also comes with knowing if you're consistently getting feedback that is not positive, or you do not see a change in the person or his behaviour or her behaviour, or the activities engaging, then that also affects learning in the sense of "Okay, well that doesn't work, what can I do next?" So certainly the whole scenario, the whole simulation constantly makes you think about how you're processing, how you're affecting people, what you can do better, or how you can make it work so that it begins to flow as a culture. (Monica, Interview)

This idea of thinking about one's own way of problem handling suggests metacognitive development in the students, especially as related to knowing what one knows and what one doesn't know. Knowing about one's own knowing is asserted as very helpful for an individual to learn more effectively (Brown, 1987; Flavell, 1976; Lin, 2001; Weinert, 1987).

It must be added that discussions of the design of Aberhart Junior High School did not mention scaffolding. I think it was probably because of the issue of exercise of responsibility, a design feature in this course. By the exercise of responsibility, the designers wanted the students to act as principals independently with full responsibility and deal with issues and problems accordingly. This way, they would not be involved only as "...observers..." with little, if any, responsibility "...when difficult situations occurred" (Maynes, McIntosh, & Mappin, 1992, p. 271). Besides, the collective activities during the debriefing session in Aberhart Junior High School might be interpreted as providing some kind of feedback. Scaffolding is the tailored help provided to assist learners in carrying on their work at a critical moment when they feel it is especially difficult to continue on their own. When students shared their puzzles at the debriefing, they were inviting support from more experienced peers and experts. On the other hand, the peers and experts who offered advice and comments on the puzzle were in fact providing the support that targeted what the puzzled students wanted to know. Nevertheless, it was the right kind of help that supported the students' learning and problem solving (CTGV, 1992). It must be pointed out that such feedback took place during debriefing seminars, outside the computer-based simulation component.

Based on the students' comments on the feedback and how it functioned in relation to their learning, it appeared that it might be helpful to provide scaffolding in the simulations. On the other hand, how feasible it might be to provide scaffolding in those simulations remains a question. It might prove a huge undertaking that is beyond most people or institutions. Further, how feasible it is to provide scaffolding in the computer-based simulation remains a question. Theoretically, scaffolding must be relevant to the content and situation the students are encountering. It must be context sensitive, that is, it must change with the changing circumstances in the simulation. In short, scaffolding should be provided in ways that are tailored to the individual needs of the students. Scaffolding has to be delivered in a timely fashion, that is, within a very short time when the students need help. Because of the different backgrounds of the students and the problems they will encounter, their needs will vary. Take the students' expectation of feedback or their decisions, for example. It was almost impossible to anticipate the full range of decisions the students might make when the simulation was developed. It would thus be equally difficult, understandably, to provide feedback that was tailored to the specific needs of individual students. Some students suggested that a character in the simulation play the same role as the instructors play in face-to-face classroom learning, so that when individuals make their decisions the pros and cons would be analyzed by this character. Again, this is not feasible because the character has to be pre-programmed and any analyses the character provides must also be pre-programmed. Not being able to anticipate the specific decisions students will make, the character cannot be pre-programmed with corresponding analyses. Another option might be to collect student examples of resolving issues and problems and shoot them as video clips. The video clips could then be incorporated into the relevant part of the simulation. In subsequent years students in the simulation could review these instances of problem-solving after they made a decision on the related problem. This would also be very difficult to do because students will continue to approach similar problems in differing ways. There may be a difference, many times a rather big difference, in terms of individual problem-solving abilities, the situation or the circumstances in which the problems were and are being solved. Besides, it is quite costly to produce good quality digital video, although it is no longer so great a challenge to incorporate it into the simulation materials.

As I have shown, the students spoke positively of the help received from the instructors in the class, and of the possible targeted feedback to their decisions. It showed they appreciated and valued the support that was geared to resolving their puzzles, although such support was not really provided in the simulations. The feedback was highly regarded because it helped students gain confidence in their decisions and resolve things they were puzzling through.

Scaffolding can be seen to greatly facilitate students carrying on their learning in its initial stages or at some critical moment when they feel most challenged (Brown et al., 1991; Choi & Hannafin, 1995). The suggestion of a simulation character who provides tailored feedback to individual students following their decisions is not seen to be feasible due to the inherent limitations of a computer-based simulation. As has been discussed, it is almost impossible to embed targeted assistance for each student at the time s/he may need it most.

Another suggestion was that problem-solving cases be collected from students and shot into video clips which would then be incorporated into the simulation in an on-demand format, much like the play of memory flash clips. This is not seen to be feasible, either, because of the changing circumstances and situation for each student, and the cost involved.

Cognitive apprenticeship: A path from novice to expert

Cognitive apprenticeship refers to a relationship between a learner and a master which involves cognitive/mental exchanges with the master providing expert advice. Many students valued expert advice and models for success. They believed their learning would be more effective if they could follow advice from experts or more experienced peers, or refer to strong theoretical models (Belinda, Casual conversation, Interview; Kathleen, Interview; Kitty, Casual conversation, Interview; Mona, Interview; Monica, Casual conversation, Interview). Their thoughts about the relationship between expert or experienced peers and novice learners agree with an idea of apprenticeship in which the experts and experienced peers provide advice and examples and guide the novices (Brown et al., 1991; Choi & Hannafin, 1995, Lave, 1989). When asked for input to improve the course, Kathleen suggested a positive model of resolving problems successfully in the simulation might be helpful in terms of enhancing her learning and deepening her understanding of the issues: "… maybe I'll talk about some positive models right there in the simulation, for example… There's a lot of interesting research that could shed some light on the way of dealing with the problem, or why the problem occurs…" (Kathleen, Interview).

For Kitty, a positive model meant an expert or more experienced peer guided her with her/his successful experience accumulated from the authentic work s/he did in real life. She believed that the more experienced peers could serve the same role model as the instructors had been serving. She proposed that some seasoned school principals or assistant principals be invited to the class to share their views on some large issues confronted by herself and her peers in the simulations. She pointed out that all students in the simulations had their own unique ways of problem solving. As a result, "…we've got lots of alternatives. But I'd like to hear somebody who's got experience, what do they have to say." (Kitty, Interview) Kitty did not specify whether all these should take place in the computer-based simulation component, or in the debriefing seminars. Based on the storage capacity in the existing simulation and on my personal experience, I think what

Kitty suggested may be difficult to do in the computer-based simulation. It would be more feasible if it were outside the computer-based simulation component, but inside the course, perhaps, during the debriefing seminars.

Along with Kitty's suggestion in terms of consulting an experienced school administrator or an expert, a less formal conversation could take place between the expert and herself, during a debriefing seminar. As a matter of fact, this happened in this class as one of the instructors had been a school principal for 10 years prior to teaching at the university and some students in the class were experienced school administrators as well. A student could seek advice from these experts on difficult issues they felt were difficult to deal with on their own. These conversations addressed both problematic cases and points of interest. It was, therefore, more than the apprenticeship relationship of simply emulating the actions of the experts and more experienced peers. Such exchanges did not provide straight answers to the questions a novice asked. In future, such a dialogue between the expert and novice could deal with the possibility of improving both the action and the underlying process (Brown et al., 1991; Choi & Hannafin, 1995; Collins, Brown, & Newman, 1989; Lave & Wenger, 1991). Such a dialogue would show the novice learners how an expert employed strategies to resolve complex, real-life issues (Brown et al., 1991; Choi & Hannafin, 1995). Hopefully, it would lead the novice learner to ask questions that an expert problem-solver would ask herself/himself (Savery & Duffy, 1996; Schoenfeld, 1996). In many cases, it would clarify things that might otherwise remain problematic and would help make the especially difficult cases more comprehensible and addressable. It could be, in effect, a relationship of cognitive apprenticeship. Belinda's (Interview) recollection of one of her conversations with one of the course instructors showed exactly that. She recall the end of one class when other students had left the classroom where she talked to the instructor about a problem she encountered in the simulation but was puzzled by it. She asked the instructor for some ideas or suggestions. She felt that she was networking with a principal who offered his view on the problem, but not his solution to it. Belinda believed that the conversation helped her clarify things and facilitated her decision-making. She pointed out that the instructor, like other school administrators with whom she networked, "…don't want to tell you exactly. But they give you from their experiences, and from their and your own experiences you can make really pretty good decisions" (Belinda, Interview).

For some students, the exchange and the successful models provided by an expert not only persuaded them to follow an expert's thoughts and problem solving approaches, but also started them thinking about their own way of looking at things and solving problems. It enabled them to find their own strengths and weaknesses and act accordingly. It suggested a kind of metacognitive approach, in which one was able to "…understand and monitor one's own thoughts and the assumptions and implications of one's activities" (Lin, 2001, p. 23). More specifically, one was engaged in thinking about oneself, about one's own strengths and weaknesses, about the nature of her/his learning task, and about the social milieu in which the learning was carried out (Flavell, 1976; Lee & Smagorinsky, 2000; Lin, 2001). Kathleen was one of those novice administrators who claimed her interaction with more experienced peers during class discussion supported her:

> I think I've got a lot more value at the class discussion with respect to these different scenarios than I did by turning to imagining how I might solve it. Although it depends on the scenario, some of them seem

> to be very straightforward to me in terms of some of the approaches you need to take. You can ask them questions. You can say: "Well, why is he doing that?" or "Has he done it properly?" And then you can say: "Well, if he's not doing it properly, how would I deal with it?" And I would look at what I did before and see if anything needs to be changed. (Kathleen, Interview)

Monica believed the exchange between peers were, many times, thought-provoking. They started her thinking about her own way of approaching things. It supported, in a way, her metacognitive activities:

> ...the dialoguing with colleagues was excellent. The listening to their stories and some of the experiences they had was a very powerful tool to kind of help you help myself to become a better learner, and kind of think outside a box that you sometimes get yourself into, because when you hear someone else's point of view, you think, "Oh, I wouldn't have thought of that." But that's really a good way to look at the problem or consider the problem. And it certainly made you reflect on the things you did, the choices that you made, and the way you thought. (Monica, Interview)

There is no doubt that the students valued the experts and experienced peers' expertise and experience. They helped the novice administrators clarify many things, particularly problematic cases or points of interest. Such learning mainly took place in the classroom seminar discussions or on other occasions that were outside the simulation component. This is pointed out by Mappin (1996) when he discusses enculturation in Pembina elementary School simulation. He argues, albeit not within the framework of situated cognition, that cognitive apprenticeship is achieved through collective activities practiced in debriefing seminars in the course but outside the simulation component. According to Mappin, the activities, collective problem solving, displaying multiple roles, confronting ineffective strategies and dealing with misconceptions, function as a process. Through this process the students, especially the novice administrators, could grow into full participants by observing and learning from the experienced ones (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991).

However, it is possible and doable to create the cognitive apprenticeship manifested in debriefing sessions, using computer technology. As Reeves (1993) contended, a well-designed multimedia environment is able to include "…opportunities for simulated apprenticeship as well as a wealth of learning support activities…" (p. 107). The expert advice and the successful models to be shared by experienced peers could be provided and/or shared through such computer technology as email or computer-mediated conferencing (CMC).

CMC may consist of various formats and tools, but, in this case, CMC refers to text-based methods. I think a CMC environment could be created within the simulation in which the students could share and comment on peers' work. Instead of talking to peers to share their stories or commenting on peers' work in the debriefing seminars, the students could do all those through writing employing techniques of CMC. These might, conceivably, also take place of the journaling assignment in the course. At different times it might be one-to-one, one-to-many, many-to-one, or many-to-many. This way, a student could post her/his message onto a conference or chat at anytime when s/he needed to during a simulation. Alternatively, s/he may consult someone individually on especially problematic things via email during or after the simulation session. Besides, the students could also discuss or comment on texts that are posted on the public place in a conference or on a web site, or they could share their success stories there. Moreover, they might explain how they do things and why they do things differently. Relevant documents and resources may be provided through various hyperlinks. These documents and resources should be provided at the points where the designers anticipate the students may encounter hurdles. As the documents and resources would be closely related to those hurdles, they should assist the students in overcoming them. Perhaps most importantly, the instructors could intervene with comments, questions, or hints, at critical points to keep the students on the right track. Such activities in CMC augment classroom activities (Pena-Shaff, Martin, and Gay, 2001). They provide a take-and-share way of knowing. They constitute a process of both social and individual meaning construction (Greeno, 1997). The interactions between the students using CMC thus provide opportunities for them to brainstorm and see different perspectives that may foster new meaning construction (Heller and Kearsley, 1996; Ruberg, Moore, & Taylor, 1996). It is quite possible that the same kind of cognitive apprenticeship reported by the students in their debriefing sessions could occur in CMC interactions. Perhaps these same CMC activities would engage students in some metacognitive activities as well. The cognitive exchange with a master and different ways of addressing same problem may start the students thinking about their own approach to the problem and wondering why they have dealt with it differently.

One drawback to introducing CMC in the simulations is that it may take more time, in fact, much more time, for the students to work on already demanding problem-solving tasks. As was reported earlier, many students pointed out the intensity of the problems to be dealt with in each simulation session and felt that they had little time to spare on things other than problem-solving during that work session. With time-consuming CMC embedded in the session, it is more likely that students will not be able to cover the same number of problems that they do in the current simulation design.

A solution to these concerns would be to reduce the number of the problems in each work session. Quality, rather than quantity, counts. The students could certainly benefit more from solving a problem well and completely, or from learning how well and completely the peers have solved a similar problem, than from solving several problems in a rush. The essence of this type of education, after all, is to cultivate the students' methods of critical thinking. On the other hand, reducing the intensity of the problems may compromise the students' breadth of experience, one of the issues the designers of the simulation course aimed to address. As Maynes, McIntosh, and Mappin (1992) point out, the intensity of the problems in the simulation is a design feature with a pedagogical purpose, that is, it provides a taste of the stress principals experience while resolving issues in real life. Reducing the number of problems may thus be a trade-off to this design feature and the gain from such a trade-off may not justify the loss of a sense of stress. It is, therefore, debatable how best to proceed. One way would be to allocate more time to each work session since part (or all) of the function of debriefing would now be replaced by CMC. Longer work sessions might also be more feasible if students did not have to come to campus for the work session. The computer-based simulation could be accessible on the Internet. Students might be able to devote an additional half hour to each work session because they would not have to spend at least half an hour driving to and from campus. By putting the whole computer-based simulation on the Internet and making it accessible from anywhere anytime students could work at their home or office.

Another concern is that CMC may take the students out of their role as Kelly Goslyn in the computer-based simulation. While working on CMC, either writing on what one does or commenting on peers' work, the students may be engaged in more thoughtful communication but may find themselves disengaged from the computer-based simulation (Janassen and Kwon, 2001).

Finally, there is the problem of maintaining the simulated world when there are as many as 12 Kellys. If all 12 students logged in as Kelly, it would be very confusing as to who was who. There would be some capable Kellys (those played by experienced school administrators) and some novice ones (those played by the students who aspired to be school administrators). In a face-to-face environment, instructors have ways to deal with students who have the same name but they never face a problem of this magnitude. In an online environment it would be a difficult problem to resolve while still maintaining a way for students to stay in role. One way to address this issue of multiple principals all named Kelly may be to ask the students to put themselves in the shoes of fellow principals commenting on peers' work on a seminar or social occasion. It again requires them to suspend their disbelief, a necessary precondition to learn in this computer-based simulation.

CMC could be provided within the computer-based simulation as a supplement to, or, in a totally online version of the course, as a substitution for the 'Response Record' where the students made their choices regarding the action to be taken, the importance of the action, and priority for their action (Figure 5, p. 13). Unlike the debriefing seminars, the communication in this suggested CMC could be asynchronous. Since the students would not have to come to campus for the work session, they do not have to work on the simulation at the same time. They could work on the simulation at a time and place that is convenient for them, although they would still have to discuss, share, comment on the issues they are dealing with, and to do all of the requirements and submit their work before or by the deadline. Working this way, the students could remain in the simulation even when they were experiencing a form of cognitive apprenticeship. As proposed, the CMC activities become an integral part of the simulation.

The expert advice aspect of cognitive apprenticeship could also take place through CMC in both synchronous and asynchronous modes. Synchronously, there will be an "on" time during which all students and instructors will be online participating in learning activities. During this time they may share their ideas, or ask or respond to questions. Asynchronously, they may do the same any time but there is a request that any questions asked, issues raised outside 'on' time must be addressed within 24 hours after their occurrence. With CMC now as an integral part of the computer-based simulation, the CMC environment might be extended to serve as a venue where school principals share their experience and lessons in school administration in a wider fashion. Individuals using such a CMC facility could be principals or assistant/vice principals who come to this place with their unique issues/problems they encountered in their respective schools. Instead of everyone being Kelly, now they would be talking, sharing, and commenting as school administrators with names like Johnson or Wong, Jane, or Hassan. In such an environment the instructors could always contribute to make sure things were on the right track.

Collaboration: Learning in social milieu

Earlier in this report collaboration was argued as one of the key elements in a situated cognition model. Collaboration aims to cultivate learners who work together and develop greater "…social and intellectual interdependence and a trust in the value, process, and power of civil society" (Bruttee, 1999, p. 2). Seen this way, collaboration suggests a social aspect to learning. Collaboration may be seen to support ideas of the social construction of knowledge (Jaworski, 2000; Roschelle & Teasley, 1995). This social aspect of learning was perhaps most highly regarded among the students. They believed that sharing, networking, and dialoguing among peers and members of a community played an essential role in their learning and they learned much from each other through such social interactions (Belinda, Casual conversation, Interview; Bush, Interview; Kathleen, Interview; Kitty, Interview; Mona, Interview; Monica, Casual conversation, Interview; Shelia, Casual conversation, Interview). Learning, as Lee and Smagorinsky (2000, p. 2) interpret it, is "…mediated first on [an] interpsychological plane between a person and other people…" and that "…quite complex practices can be learned effectively and easily where the social context is evident and supportive…" even if there is minimal instruction (Brown & Duiguid, 1989, p. 51). While working on the same project, members of the team, or peers who collaborate through sharing and commenting, note the differences between team members in approaching tasks, interpreting data, and accomplishing those tasks. Moreover, the team members or peers may find remarkably different approaches adopted by other teams and peers. The experience widens their perspective, making them understand that there are multiple approaches to the same project and the final result may vary, sometimes greatly, with different approaches and different people. Evidence of the students' appreciation for collaborative learning was abundant, although they did not have any in the computer-based simulation. One piece of such evidence was from Bush, a believer and proponent of collaboration. In his discussion, Bush appreciated the opportunity to collaborate because it offered an opportunity for him to learn from others who worked as he did. According to Bush, working together was part of a school principal's daily practice in real life. It enabled him to see things from various perspectives, to learn from more experienced peers, and to empower them. Another merit of collaboration, according to Bush, was that he could "…brainstorm different ideas…" with peers. From the brainstorming, "You can look at [things] from different angles in a totally different fashion, as you would possibly something else…" (Bush, casual conversation, Interview). And Bush attested that "…the whole art of collaborative practice is so, so important. It really makes it easy on you and it makes it easy on others." (Bush, Interview)

Other students shared how collaboration with others helped them grow, and understand and solve problems that they might not have been able to deal with on their own. It suggested the idea of the zone of proximal development (ZPD) (Vygotsky, 1978), and the idea of construction zone by Newman, Griffin, and Cole (1989). Newman, Griffin, and Cole refer to the ZPD more generally, pointing to the construction zone as a location in the teacher-learner interaction in which understanding could arise. In this zone, or the "…locus of social negotiations about meanings," (Newman, Griffin, & Cole, 1989, p. xxi) an individual may achieve more than her/his current ability allows her/him to, with appropriate assistance or instructional scaffolding or a little help from more experienced learners (Bruffee, 1999; Schunk, 2000). In the course being studied people were engaged in a shared activity. They carried on conversations and sought a common ground of comprehension and understanding through the social negotiation of meaning. In the process people sometimes changed their original thoughts as to how a problem was to be solved, as Kathleen attested:

> … I like group work so that we can look at it and people can put their different views on it. …I know people have different ways, so when everybody shares, you can get a number of ways of coping with it. (Kathleen, Interview)

Owing to this sharing and conversation, Kathleen pointed out, she was able to understand things that she had not been able to comprehend in a couple of cases. She thus changed her mind as to how to resolve the related issues. As was reported earlier in this study, the conversations, the sharing, and other forms of collaboration took place in sessions outside the simulation component, mostly in face-to-face debriefing seminars.

Collaborative work does not necessarily mean peers must work on the same project or problem. Rather, we might consider collaborative work to include occasions when people work on something in a casual manner. For example, when a student shares her/his approach to a problem and involves peers in making comments and suggestions. It is collaborative work because all those involved are working on the same thing, that is, on the solution to the problem, although the problem may belong to that one individual. In this case, ZPD may come into play. The collaborative work that Sheila and Kitty experienced during the debriefing provided more evidence for the effect of ZPD. Sheila shared a problem she had encountered and how she dealt with it, with her peers. She said that the collaborative work was "excellent" because she was able to "…hear that [what] other people had to say…" about her solution to the problem, or to see and/or hear her peers take her solution "…just a little bit further…" (Sheila, Interview). As a result, Shelia was able to find out whether she was "…on the right track," or whether "…there's a little bit more that I neglected to say, and could add to the solution." (Sheila, Casual conversation, Interview)

In her statements Kitty credited collaboration as providing her with different perspectives which enabled her to see consequence after making a decision and allowed her to contribute to problem solving when sharing her experience with peers.

> So that there's more talking and more sharing. And it's not the same people talking all the time. I really enjoyed hearing about them… Because now I can think, "Well, gee, he's actually dealt with that, and this is how we dealt with it, but this is the consequence after." And these real people who experienced the real problem helped me put that in context. So I like that part of the course, the debriefing, especially in the small groups… these people have real experience, you just think maybe your place should be sit and listen. But… it forces you to add an opinion, which is a valuable opinion. So I think it validates your own problem solving as well. (Kitty, Interview)

In addition to being able to learn from others, collaborative work is seen many times as thought-provoking, able to start people thinking about their own learning. It becomes intrapsychological (Lee & Smagorinsky, 2000; Newman, Griffin, & Cole, 1989). Theoretically, it could also enable the occurrence of metacognition for some students. Through it they were able to expand their own cognitive processes, leading to improve understanding and better monitoring of their thoughts and the assumptions and implications which underlay their actions as well (Brown, 1987; Flavel, 1987; Lin, 2001; Livingston, 1997). Portland was another student who thought that the collaborative work made him reflect on his own learning. This also suggests the occurrence of a kind of metacognition during the debriefing:

> In fact, I'm able to make these decisions but I can discuss with colleagues, I can actually think about why I'm actually doing this because this is the way I've always done it, because it's the way, or whatever. (Portland, Interview)

Monica, as was previously discussed, was another person whose description of collaborative work showed a level of metacognitive awareness.

All the reported instances of sharing or collaboration, however, took place outside the computer-based simulation, mostly during the debriefing seminars. This again involved the design feature of the exercise of responsibility which required students to assume full responsibility and resolve issues by working on problems by themselves (Maynes, McIntosh, & Mappin, 1992). I suggest that the collaboration and sharing that took place in the debriefing seminars be fostered in the computer-based simulation as well, through the methods I have discussed. With a conferencing system, chat room and email, CMC could provide a space within the simulation component for students to share and comment on each other's work. The students could then use various CMC tools at their convenience. They would still have to meet all requirements, including the minimum comments they must make and the deadline for their comments. In fostering collaboration, we may require each of the students to post at least once under the related topics in the CMC. The students may also be required to select one of their solutions to the problems and post it on the CMC. As well, we may require that all students comment at least once on the solutions each individual student posts, and they will be credited accordingly. Besides, the individual student could consult other students on some of the problems that s/he feels are especially difficult to resolve independently. Such consultation could be done through email, the conferencing system, or in the chat room. Moreover, the students could share their success stories of resolving similar problems in the past. Through the sharing, commenting, advising others, or being advised by others through the use of CMC tools, the students would actually support each other. They would be sharing their personal experiences, they would be playing the role of cognitive master or cognitive apprentice. More perspective would be obvious. Students would be building a community that serves as a nurturing location which would help individuals achieve more than their current abilities allow them to. Courses using CMC tools provide collaborative spaces and can involve "…open sharing about personal experiences… and promote a sense of community…" that may contribute to "…the emergence and evolution of deep and grounded understandings, providing participants with opportunities for critical reflection." (Barab, Thomas, and Merrill, 2001, pp. 132-133)

We have seen that students felt collaboration was part of their daily practice at school but it was not practiced in the computer-based simulation. Their experience in the debriefing session, however, showed their high regard for collaboration. Collaborative work is proposed for the simulation through the introduction of CMC tools and related activities. By requiring the students to contribute to these activities, collaboration could be nurtured helping to build a community and, in turn, extending an individual's capability, enabling her/him to achieve more than they could alone. At the same time, the introduction of CMC and the building of an online learning community may be a trade-off with maintaining the "exercise of responsibility" (Maynes, McIntosh, & Mappin, 1992).

Chapter Six: Summary, Model, and Implications for Future Research

Summary

In this dissertation I have used a case study approach to interpret and describe the students' learning experiences in a computer-based simulation course focused on the junior high school principalship. The descriptions and interpretations illuminated the presence and absence of six elements of situated cognition in the computer-based simulation component of the course and what the students perceived the impact of those elements on their learning to be. The students also reflected on how the simulations and the other course activities helped them to become experienced and skillful school administrators.

In general, the course as a whole (not just the computer-based simulation component) has been very positively perceived and was thought to be very effective, as attested by some students in their testimonials:

> I think of all the courses I'm taking right now, this is the one where the most learning is going on. The fact that I need to journal, and we're focusing on writing and reflecting, we are involved in new technology in the simulation and are forced to think about the problems, we debrief [our solutions] as they are in large picture and small picture. What else can we add to it? I think it's very effective. (Kitty, Interview)
>
> I think the course is well-constructed. I think it provided the closest thing you get for the real situation without actually being in the school. Following someone around, and watching how they interact the problem solving, and so on. So, for that perspective, I think it's ideal. (Portland, Interview)
>
> I think as far as the course goes, it gets you right involved in the

> problem. You know when you're right there and you have to respond individually, you really do have to get your feet wet. You don't just kind of do it in the book. So, I think the course is really very good. (Shirley, Interview)

While they were generally satisfied with the course the students felt that there was room for improvement in organizing learning activities for more effective learning in the computer-based simulation component of the course.

Cognitive apprenticeship, for example, was an element of situated cognition that many students believed could possibly advance their learning in the computer-based simulation. Specifically, the students thought that they might benefit even more if expert advice such as they experienced in the debriefing sessions was provided while they worked on the problems in the simulation. When the absence of cognitive apprenticeship was drawn to his attention, Copperfield suggested that Kelly be programmed to show the staff that "…this person [Kelly] actually has a lot of technical knowledge about teaching…" (Copperfield, Interview). In other words, Kelly should have shown, in some cases, her/his instructional leadership. This sounded plausible, yet might be impractical. One concern here was an inconsistent Kelly – a capable Kelly in a few cases while a passive one in the rest of the computer-based simulation. Most importantly, the very reason for having Kelly largely absent in the events and issues was a design feature which allowed the students to act as Kelly to deal with and resolve the issues/problems without having actions they might not have taken imposed upon them.

Copperfield, like his colleagues in the simulation, could have stepped up and shown the staff at Aberhart Junior High School and others in the simulation that he had technical knowledge about teaching and would have provided expert advice when necessary. Yet he could not since the computer-based simulation did not allow him, or any student, to interact with characters in the simulation in such a way that they might receive advice from coaching that would enhance their behaviour. CMC has been proposed as a supplementary part of the simulation which might address this. It is proposed that cognitive apprenticeship be incorporated in the computer-based simulation through CMC and the students in CMC be engaged in the same conversations they carried on in the debriefing session so that cognitive apprenticeship and, perhaps, metacognition may be fostered.

The students all agreed there was no collaboration within the computer-based simulations. At the same time, they also agreed they experienced some collaboration during the debriefing sessions through discussing their problems, sharing their solutions, sharing their past experiences, commenting on peers' work, and other similar activities. This debriefing session outside the computer-based simulation component was intentionally created by the designers of the Project Decide for collective/collaborative activities (Mappin, 1996). Many students believed that collaborative work was one of the learning activities that could foster effective learning in the simulation environment:

> Well, I think, and my criticism of the simulation, as I mentioned previously, is that there really is no collaborative work aspect interaction, and any of us being successful in the university, or in classrooms at schools know how important building relationships and interactions are. (Kitty, Interview)

> I guess just going back and you could provide more time in the actual practical session to allow for collaboration for team approach, where I can take a break and people will understand if I walk to the next desk and say, "You know, I got a problem here." Like what I might do

> on the phone if I got a situation still developing and I'm new to the district. So I would call some buddy and say, "You know this is the situation." (Portland, Interview)

> And other things I'd like to say is in the sessions themselves. A little bit more collaborative work, even if one of the sessions we got together with partners, with someone we know. And we started at the computer together. And we say, "Okay, this is the problem. What would you do?" As long as you might have it, or you can get together with five for five sessions, or five dilemmas. You can do five dilemmas. And the rest you can do on your own, which is to get a collaborative feel to it a little more. (Bush, Interview)

Obviously, support geared to the individual's specific problem provided at the time when it was encountered would possibly alleviate the students' stress, boost her/his confidence, and consequently facilitate her/his learning in the simulations. On the other hand, there might be issues of dominance and 'freeriding.' (Lea, Rogers, & Postmes, 2002). In freeriding certain members of a collaboration team dominate team work, while some other members take advantage of the rest and contribute as little as possible, as was observed by Lea, Rogers and Postmes (2002). Collaborative activities using CMC tools have been proposed for integration into the simulation as a requirement. Assessment and credit for such activities remain to be developed along with the activities themselves.

The debriefing sessions were repeatedly mentioned in the data as venues in which students claimed to have found elements of situated cognition such as collaboration, cognitive apprenticeship, or even scaffolding. As has been mentioned, these debriefing sessions were outside the computer-based simulation component, and, so, strictly speaking outside the 'situation' being examined for this study. Nonetheless, students claimed to have not only found the existence of the situated cognition elements mentioned above but had also personally benefited from them during the debriefing sessions. The students' testimonials showed their experience in the debriefing sessions composed an integral part of the totality of their learning experience in the course. The debriefing sessions, although not part of the Aberhart Junior High School environment presented as the situation in the simulations, is part of the students' learning experience. The students claimed to have experienced three elements of situated cognition, the elements of collaboration, cognitive apprenticeship, and scaffolding, during the debriefing session and their description of the experience suggested a blurred line between them. It was often hard for them to tell where collaboration ended and where cognitive apprenticeship started, or where scaffolding began. Much of the definition of these three, it seemed, overlapped.

Last, but not least, it must be pointed out that my purpose in conducting this research was to explore the effectiveness of situated cognition in a computer-based instruction environment. I also explored the effectiveness of situated cognition outside the computer-based instruction environment but inside the course. Since the students claimed that their learning had been influenced by certain elements outside the computer-based simulation environment (debriefing sessions in this case), it was a logical step for me to explore whether and how those elements might be incorporated into a computer-based situated cognition environment for effective learning.

The elements of situated cognition

As discussed in the previous chapters, student experiences showed that two elements of situated cognition, background/contextual information and authentic learning, in the simulations helped make their learning effective and robust. At the same time their testimonials showed a weaker presence of culture in the simulations. Still the students were able to assume the principalship and act in that role in the simulations, solving problems, raising their concerns, putting forward suggestion for a more dynamic culture. The students expressed enthusiasm for other elements of situated cognition for creating a dynamic, effective and robust learning environment as well, but those elements, cognitive apprenticeship, collaboration, and scaffolding were not found in the simulations. They were reported to exist in debriefing sessions that were outside the simulation frame. A few students' comments suggested metacognitive dimensions to their thinking (see pp. 179, 184-186, 195-196). Through a close analysis of situated cognition elements and data obtained from the students I feel that much of what we describe as cognitive apprenticeship, collaboration, and scaffolding play overlapped in this instance. The line separating the three elements blurred. Consequently, I am proposing combining these three elements to create a new element that has been tentatively named cognitive nurturing. Cognitive nurturing embodies some of what cognitive apprenticeship, collaboration, and scaffolding are supposed to offer in situated cognition. Empirical research on cognitive apprenticeship seems very limited. At the same time, expert advice or a successful model for action could not only help novice learners to negotiate a position within their community of practice, but might also help them to the building of core values and the culture of the community (Brown et al., 1991; Choi & Hannafin, 1995; Lave & Wenger, 1991; Schunk, 2000). Students in this research suggested that some characters in the computer-based simulation might be designed to play some role as experts in certain cases, and their way of handling problems successfully might shed light on the novice principals' way of approaching problems as well. Some hints or comments might be embedded in the simulations that would serve to place these characters in the role of mentor. As I do not think it feasible for the simulations to provide the cognitive apprenticeship proposed by the students, I postulate that necessary function of cognitive apprenticeship may be exercised if we call on the more experienced learners to play roles as mentors, or, cognitive masters in their areas of expertise, while at some critical moment instructors may also play roles as mentors or experts, as they always do in class. I suggest that the venue for these activities can be a virtual place, provided by CMC tools, instead of face-to-face encounters.

Some kind of collaborative work is another dimension I see as part of cognitive nurturing. Collaborative work was not reported as present by the students in the Aberhart Junior High School simulations but positive results have been reported for collaborative work in computer-based learning environments (Berge & Collins, 1996; Gay, Sturgill, Martin, & Huttenlocher, 1999; Herman, 1998; Jonassen & Kwon, 2001; Ruberg, Moore & Taylor, 1996). Students' accounts of their experience in the simulation also attest to the power of collaborative activity. I have argued that instead of working collaboratively face-to-face in traditional learning settings, learners in a computer-based learning environment could work together comparing, sharing, commenting, and advising using the CMC tools of email, computer conferencing and chats. Comments and/or advice from other students might enable individual students to look at a problem in a broader perspective, and improve the quality of their response. Computer mediated conferencing (CMC) has been described as providing a social milieu that enables flexible communication, equal participation, multiple perspectives, convenient contact with instructors, and reflective writing (Berge & Collins, 1996; Heller & Kearsl, 1996; Jonassen & Kwon, 2001; Pena-Shaff, Martin, & Gay, 2001; Ruberg, Moore & Taylor, 1996). From this perspective CMC may be seen to have some merits that traditional media does not have (Barab & Thomas, 2001; Chou, 2001; Jonassen & Kwon, 2001; Pena-Shaff, Martin, & Gay, 2001).

I have argued that any activities conducted through CMC may also provide some kind of timely support. Support provided when learners need it most or when the learners are at some critical moment may greatly boost their morale and facilitate their learning, thus enabling them to grow more successfully than they would without it (Choi & Hannafin, 1995; Hannafin, Land, & Oliver, 1999; Honebein, 1996). Such support is termed 'scaffolding' in situated cognition literature, but becomes an integrated part of the situated cognitive element termed 'cognitive nurturing' that I propose. Some students suggested that their learning might be greatly enhanced if timely support was provided in the computer-based simulation and was available as soon as the simulation started. As their skill level evolves, such embedded support, including expert advice, hints, directions, and, possibly tutorials, may be dismantled. I suggest that such support may be provided through CMC activities in an on-demand fashion, that is, by consulting experts or more experienced peers via email, or seeking input from peers in a computer conference or a chat room. Tutorials would be an exception to this. They would be provided in text, graphical, audio or video format at the beginning of the course when students moved to a new domain. These tutorials may cease to be available as students progress in the course. Further research might allow us to understand if and how such support might be incorporated into a computer-based learning environment such as the one that I am proposing, and also whether and how the support will enhance student learning.

Last but not least, I also believe and promote that we can develop metacognitive abilities for students if we require them to reflect on their thoughts and actions while learning with the model of situated cognition. Instead of the journaling assignment used in the course, students would be asked to use CMC tools to share thoughts about the differences between their work and their peers'; about strengths and limitations of their work; and about the added merits of the advice and comments made by experts and/or experienced peers. They would also be asked to reflect on why they did what they did and theoretical foundations of their thoughts and deeds. This way, students may better know what they know and what they don't, and the implications of their actions (Flavell, 1976; Lee & Smagorinsky, 2000; Weinert, 1987). All these functions, I believe, may be exercised through the new situated cognition element of cognitive nurturing.

An exploratory situated design model

Based on the research and literature, I am suggesting further exploration of a proposed model of situated cognition for guiding the design and development of a computer-based learning environment. I have described how each element of situated cognition, including the new element of cognitive nurturing, is supposed to work in the previous section. I have suggested that the elements of authenticity, context and enculturation would work as have been discussed in the literature and testified by the students enrolled in the computer-based simulation course investigated. I have also argued that the new element of cognitive nurturing was based on the function of cognitive apprenticeship, collaboration and scaffolding promoted in the literature. In addition, I have suggested that cognitive nurturing is needed to foster metacognition. It will require greater effort and far more sophisticated work than possible in the scope of this study to elaborate how such a model might operate. Instead, I am attempting to present a brief picture of an exploratory model and how each element of situated cognition may be seen in this model.

This exploratory model of situated cognition (Fig. 6) consists of four elements: Context, authenticity, enculturation, and cognitive nurturing. The context element provides information on history, the evolution of the issue, and its current status. It is meant to set the stage, to provide the climate or atmosphere, and to provide the mindset that will fill the gap, helping learners to understand the events, items of concern, and the characters being dealt with. The display format for the context may consist of text, graphic, audio, and video documents.

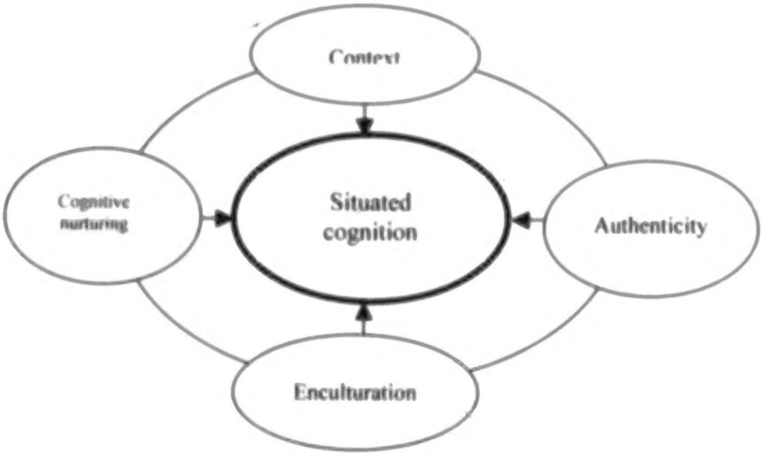


Figure 6. Exploratory Model of Situated Cognition

Authenticity refers to the representation of the stories, the areas of concern, the problems that are a replication of those in real life. Whether in text, or audio, or video format, the representation should be as genuine as it can be, enabling learners to replace work experience with their learning experience in a computer-based learning environment. Here, the breadth of experience and the exercise of responsibility would be considered as they were in the Project Decide simulations, but they would be enhanced by cognitive nurturing, which may include information in text, audio, or video formats.

The element of enculturation requires the creation of a culture, a community into which learners can be initiated and learn to play a role. The learners will gradually adopt the core values of the simulated community and move from being peripheral members to becoming full members. At the same time they all learn to be part of a second community of practice in a designated area.

Cognitive nurturing deals with the creation of learning opportunities in which neophytes would be able to learn from experts and their experienced peers. This learning may include their thinking path, learning how experienced people approach problems, how they resolve those problems, why they do it the way they do, and learning to monitor their thoughts, assumptions, and the implications of their activities. As well, metacognition could be purposefully fostered through cognitive nurturing. Cognitive nurturing could be carried out individually through counseling or support provided at critical moments when an individual needs it most. It could also be provided through collaborative work, using peer sharing, a critical analysis of peers' work, a comparison of their work with those of other learners, and a display of successful model(s).

A computer-based learning environment under the exploratory situated cognition model

Given the evolved state of the Internet today it is very feasible to suggest an evolution of the Aberhart Junior High School simulation which is totally online and which could be accessible anywhere, anytime, obviating the need for student to do their simulation work on campus. As with many online courses, their assignments could be submitted through the Internet.

When the students log in, they would come to an introductory screen similar to the one presently used in the Aberhart Junior High School simulation. It would include a function bar with various items on it. What they would see, as they started would be an introductory video clip about an issue or a problem. Following this introductory video clip may be text files or audio clips that update the students on the issue or problem to be dealt with. The issue or problem would continue to be a complex and challenging replication of a real-life problem. As now, the students would have to suspend their disbelief and assume the role of a school principal to deal with it. There would be drop folders into which the students could store and submit their work. Individual students would be required to compare their work with their peers through email in order to find the strengths and limitations of their work. There would also be a computer conference system and a chat room in which the students would be required to put at least one piece of their work for peers' comments. Each student would be required to comment at least once on each piece of work posted by her/his peers on the bulletin board. When encountering some especially difficult problem that a student could not resolve on her/his own, s/he would post it in the chat room or conference for collegial input. There would also be an email address that enabled the individual to consult experts, the course instructors in this case, if s/he could not resolve the problem after peers' comments. Individual students would then be expected to revise their work using the peers' comments and the expert's advice. Individual students would be expected to reflect on this whole process, including what s/he did in the first place, what comments the peers made, what advice the expert provided, the strengths and limitations of her/his original work, the strengths and limitations of the modified work after their peers' comments and expert advice, why s/he did what s/he did in the first place, and what s/he thinks is the main difference between her/his original work and the modified work.

The tools for undertaking this new process would all be within the computer-based simulation. Students working on problems in the simulation would use the CMC tools for cognitive nurturing when needed, just as principals chat with their staff, distribute a memo to the staff for input, or telephone a principal from another school for advice. Other students may not respond immediately to the posted request for help, as they may be working on different items. They will, however, respond to the request before or by the deadline stated in the requirements. Some process for providing course credit may have to be devised to encourage this.

One potential drawback may be the loss of authenticity when the students play different roles in the computer-based simulation. They would be principals who are actively solving problems on one hand, while on the other hand they would be helping other student principals to solve problems posted on the CMC. In this exploratory model, the students are still the principals of a school like Aberhart Junior High School but they are helping the principal from another school with her/his problem at the same time. This requires them to continually suspend their disbelief and be proactive. They may conceptualize the situation as a forum of school administrators who are sharing their work, helping colleagues while also being helped. An alternative to this might be to have the students assume the role of principal in the computer-based simulation, but each of them would use her/his real last name while keeping Kelly as her/his first name. Instead of Kelly Goslyn, now the principal's last name might be as varied as the names in Canadian society, such as Kelly Smith, Kelly Ohimed or Kelly Gao. Since we ask the students to suspend their disbelief at the beginning of the present simulations and assume the role of Kelly (Goslyn), I see it feasible to ask them to act as the principal but using their real last names. The principal in the video clips will continue to be shot as I, Kelly, the principal. The documents in this course will still be addressed to Kelly the principal, with last name dropped. When Stephane or Shirley, or any other staff person brings a problem, s/he is bringing the problem to each individual student as principal. Here each student is 'I' the principal. The students may assume the role more easily when problems are brought to them from the outset with only first name attached to the position of principal they are assuming. It might be more real, as 'I' am the principal and 'I' am either a female or male with my real last name. When 'I' submit my assignment, including my original posting in discussion, I, Kelly would submit it the same way as those in EDPS501 did. When 'I' participate in discussion, 'I' would be sharing my ideas with my colleagues in a gathering, as those who did during debriefing sessions in EDPS501. A further bonus of this might be that the students have the freedom of working with the CMC tools as required while keeping their identity. What about Kelly Goslyn? Well, Kelly Goslyn would now be just one of 'I' the principals at the gathering. S/he might be the first one to present her/his problems but now others are also presenting their problems, many of which similar or even exactly the same as those of Kelly Goslyn's. They are now posting their problems looking for clue, or commenting other principals posted problems, as they have been doing during debriefing sessions in EDPS501.

Implication for future research

As has been previously discussed, this research presents a wholistic picture of how situated cognition elements functioned in a computer-based simulation course. The research results from this particular case support the view that situated cognition elements may help to create an effective and robust learning environment. As some of the situated cognition elements were not found in the computer-based simulations, the effect of those missing elements on student learning in a computer-based learning environment could not be examined. More importantly, there were places in this report, in chapters 4 and 5 particularly, where I interpreted the students' thoughts, instead of getting their thoughts directly. The interpretation might have been influenced by my personal orientation to situated cognition and my support for it. Further research, therefore, should be conducted to examine the effects in this proposed exploratory model of situated cognition on learning in a computer-based environment using a learning environment where they can be seen to be present, and the accuracy of my interpretation. At another stream, further research may be necessary to examine the effectiveness of this proposed exploratory model itself, particularly the effectiveness and adequacy of the element of cognitive nurturing that I postulated for this exploratory model.

I have found that some elements of situated cognition do not necessarily function as has been described in the literature and the elements of collaboration, cognitive apprenticeship and scaffolding may be seen to overlap. I have proposed combining these three as one element termed cognitive nurturing. As well, I believe fostering metacognition would be worthwhile and might be achieved if cognitive nurturing were incorporated into the situated cognition model and this revised model applied in creating learning environments.

Based on the literature and this research, I have proposed an exploratory model of situated cognition which, when evolved, might be used to create a computer-based learning environment that is effective and robust. In collaboration with other elements in this proposed exploratory model, cognitive nurturing would help neophyte learners to become seasoned problem solvers through cognitive and metacognitive activities. I have argued that cognitive nurturing should be enacted through sharing and learning from experts and from more experienced peers, which might lead the learners to reflect on their own learning. Their reflections could be focused on their own thinking path, on why they did what they did, the strength and limitation of their work, the underlying theories, and the implications of their activities. I described the possible means to carry out cognitive nurturing. Whether cognitive nurturing will function as I have suggested and whether the technology tools described will be sufficient to carry out cognitive nurturing activities as well as other activities remains to be explored through future research.

Conclusion

The computer-based simulation course on the principalship is unique and successful in preparing school administrators as has been shown. This research identified the situated cognition elements in the computer-based simulation component of the course, and investigated how those elements have affected student learning. The research results support the view that including all elements of situated cognition may help to create a learning environment that might be as effective and robust as the current design for the simulation course, or, possibly, improve it. Further scholarly work should be continued to enhance our understanding of the effects of situated cognition elements on learning in a computer-based learning environment. This pedagogical approach could continue to benefit learners and instructional designers in designing and developing computer-based simulation environments that are situated cognition-oriented.

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APPENDIX A

Interview Questions (Sample Only)

Winter, 2002

1. What are the elements that provide background information in the computer-based simulation? Please list a few examples in the work sessions that provide you with background and contextual information.

2. I would like to explore how your understanding of the events and stories in each work session is affected by various contextual elements of the computer-based simulation. When I ask you about each, please comment on the effect and usefulness each has for you:

a) the orientation and practice

b) short introduction before each session

c) staff profile

d) memory flash (i.e., do you remember, talk to people)

e) the embedded file materials in Aberhart Junior High?

3. How closely do you feel the problems and activities in the computer-based simulation approximate those in the real life or work of a principal?

4. When you solved problems in the computer-based simulation, did you recall any similar problems or situations in your teaching or administration of work?

5. Could you give me some examples in the computer-based simulation that resemble what principals actually do in real life and work?

6. In what way is the organizational culture of Aberhart Junior High school represented in the computer-based simulation? How does it help you feel like the principal at that school?

7. When you arrive at class to begin working on work session, what helps you assume the role of Kelly Goslyn and act as the principal of Aberhart Junior High?

8. Do you see anything in the computer-based simulation that helps you deal with problems you perceived while working as the principal at Aberhart Junior High?

9. What help did you find in this computer-based simulation that facilitated your getting started and carrying out your tasks in the early work in the simulation?

10. Did the computer-based simulation support and encourage collaboration during the work session? Could you give me some examples (if yes)?

11. Would you say you have learned something about the principalship or administration from your interaction with the characters in the simulation?

12. What are some of the things, if any, in the simulation that enabled you to deal with problematic or especially difficult cases by observing how your colleagues at Aberhart Junior High school?

13. Please describe how the background or contextual elements in the simulation affected your learning, for example, your understanding of (i.e., how to deal with) a problem, a story, etc.? Can you give me some examples?

14. How real did you think the problems and activities in the simulation? What effect do you think this might have had on your learning?

15. Please recall that earlier we talked about solving problems in the computer-based simulation and its relation with the similar experience in your teaching or administration of work. In what way does the realism of these problems affected your learning (i.e., your dealing with problems)?

16. Please recall our discussion a few minutes ago on the organizational culture at Aberhart Junior High. Could you describe in any way this culture influenced what you learned?

17. Do you see any changes in terms of availability, kind, and/or quality of the help offered in the computer-based simulation course (please disregard the help from instructors and/or peers) ? How do you relate the help to your learning?

18. Please comment on team work, or collaborative work in the computer-based simulation? What effect does it have on your learning?

19. How did your interaction with the characters in the simulation affect your learning, i.e., your way of dealing with problematic and/or especially difficult cases?

20. Did the computer-based simulation cause you to think about your own process of learning, that is, how you know when you have learned something? Please elaborate.

21. Please now focus on the course. Can you think of any other elements that are not in the present course but should be added to it so that it helps students think about how they learn and how they solve problems?

22. Please think for a moment about the features in the course as a whole that helped you learn (or solve problems). What else do you think can be added to the course so that it could enhance your learning?

23. Can you think of any other elements that are not in the present computer-based simulation but should be added to it so that they would help in the future to enhance the modules and student learning?

Appendix B

Interview Schedule

Schedule for Interview

Name of the Participant	**Time**	**Location**
Rosemary	Monday afternoon, March 4, 2002.	3-119 Education North building, the University of Alberta
Belinda	Monday afternoon, March 11, 2002.	3-119 Education North building, the University of Alberta
Kitty	Tuesday afternoon, March 12, 2002.	3-119 Education North building, the University of Alberta
Copperfield	Friday morning, March 15, 2002.	the participant's office at school
Shirley	Monday afternoon, March 18, 2002.	3-119 Education North building, the University of Alberta
Cynthia	Wednesday afternoon, March 20, 2000	the participant's office at school
Shelia	Thursday morning, March 21, 2002.	the participant's office at school
Bush	Thursday afternoon, March 21, 2002.	3-119 Education North building, the University of Alberta
Portland	Monday afternoon, March 25, 2002.	3-119 Education North building, the University of Alberta
Mona	Monday morning, April 1, 2002.	135 Education South building, the University of Alberta
Kathleen	Thursday afternoon, April 4, 2002	The participant's office, Education North building, the University of Alberta
Monica	Monday afternoon, April 8, 2002.	3-119 Education North building, the University of Alberta

Appendix C
Consent form

Dear Ms./Mr. :

I am conducting qualitative research of technology-based instruction. Technology, information technology in particular, has been increasingly used in education. Accompanying the diffusion of technology in education are various theories that explore how effective and robust learning can be achieved in technology-based instruction courses. I am interested in investigating and identifying the elements in this course that are seen as positive for effective and robust learning from the point of view of situated cognition. If possible, I will build a model of situated cognition on the elements that will have been investigated and identified in this proposed study. It is hoped that the model may provide some guiding principle for effective and robust learning in technology-based instruction environment.

I will conduct the proposed study at your class in the winter semester (Jan. 2002 - Apr. 2002). I would like, therefore, to collect my data from students like yourself in this class. I would hereby invite you to participate in and cooperate with this study.

As part of the study, I will conduct classroom observations by attending your class weekly. I will write down my observations of the class, including my observations of you. As well, I may have casual conversations with you while attending the class. In our conversations, I will focus on the learning activities and your thoughts about them in this course. The conversation will be recorded in writing. I will conduct a formal interview with you and ask you to reflect on the learning activities and instructional elements in this course, as well as some of your own teaching practice. The interview will last from 30 minutes to two hours. The interview will be tape recorded. The collected information will be transcribed and forwarded to you for your verification before it is released. At the end of the course, I will distribute a survey questionnaire to all participants in this study. I will ask you to answer course-related questions in the survey.

Please be advised that this research is not part of the course. It is part of my doctoral work. Your participation is voluntary - you may choose to participate or not participate in the research. Your decision will not affect your academic status in this course, or in your program at the university. You may opt out any time during the study if you choose to participate, as long as the collected data have not been incorporated into my analysis. Your withdraw from the research will have no effect on your status at the

(Please detach and forward the signed portion)

Situated Cognition in Technology-based Instruction

I, ______________________ have read the attached letter from Guohua Pan, dated ________________, requesting my participation in the qualitative research of Situated cognition in technology-based instruction. I am aware of all the benefits and possible risks involved in my participation and agree to participate with the following understanding:

1) I may withdraw from the study at any time,
2) I may request that all or some of the data concerned be omitted with conditions,
3) my name will not be used in any reports,
4) the data may be used for publication, in work reporting and directly related to this study
5) my participation or withdrawal will have no effect on my academic work,
6) the data to be collected will be subject to the same procedures and constraints as outlined in the information sheet.

______________________________ Signature

______________________ Date